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A Revision of the North American Species of Ophioglossum.

(PLATES 318–319.)

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The Fourth of July excursion of the Torrey Botanical Club in company with the Philadelphia Botanical Club and the Washington botanists, took place at Wildwood, New Jersey, a flourishing seaside colony about 12 miles from Cape May. On the afternoon of the 3d, Mr. Joseph Crawford, in company with Mr. Pollard, and Dr. Valery Havard, found a patch of *Ophioglossum*, between Holly Beach and Wildwood, growing in open woods under holly and oak trees (*Q. nana* and *Q. falcata*), in sandy soil where the grass had been cut. This single colony was the only one found in the region, and contained hundreds of plants, all in mature condition and beginning to turn yellow, thus making the patch a conspicuous object. All of us who had seen *O. vulgatum* growing, felt positive that this was not that species nor any other with which we were familiar. I was delegated to describe and name it and decided to call it, from its habitat, *O. arenarium*. I sent a specimen to Prof. Underwood, then at Kew, for comparison; after consulting with Mr. Baker, it was decided that it belonged to the section with *O. lusitanicum*, which has a similar gregarious habit, but differs in its much smaller size and narrower frond.

Prof. Underwood has called my attention to a monograph of the genus by Prantl (Jarhb. d. K. Bot. Gart. Berlin, 3: 297–350. 1884), in which two new North American species are described, thus far not included in our text-books, *O. Engelmanni* and *O. Cal-*

iformicum. These are perfectly distinct, and *O. Engelmanni* has a wide range, having been found in all the larger herbaria, such as those of Torrey and Gray, Eaton and Underwood, Canby and Gilbert, Engelmann and the National Herbarium. *O. Californicum* has thus far been seen only from the type locality at San Diego, California, where it was originally discovered in 1850, and specimens sent to Dr. Torrey by Dr. Parry, and from two other stations.

Through the kindness of Dr. Evans, Dr. Robinson, Dr. Rusby Prof. Underwood, Mr. Pollard, Mr. Davenport and Prof. Trelease I have been able to see a large number of specimens of this genus and have been particularly interested in studying the variations of *O. vulgatum*. Seven different forms of the sterile lamina can be named as follows: 1. Ovate-amplexicul, acute. 2. Ovate-sessile, obtuse. 3. Oval and elliptical, acute and obtuse. 4. Oblanceolate or obovate with tapering base. 5. Lanceolate and smaller. 6. Rotundate (immature). 7. Linear-lanceolate, occasional.

It seems a little difficult to tell some of the young fronds of *O. vulgatum* from the mature ones of *O. arenarium*, and yet the extremes are so different, and the habit and habitat so distinct, that I have concluded to maintain them as separate species. That *O. arenarium* has originated from *O. vulgatum*, and that intermediate forms may be found in young or poorly developed forms of *O. vulgatum* does not alter the view from the modern standpoint of evolution.

Young and immature specimens of what have been supposed to be *O. vulgatum* have been collected by a number of American botanists. In the Torrey Herbarium, unnamed, there is a sheet with six small immature specimens, two bearing fertile spikes and the following note by Dr. Gray:

Ophioglossum n. sp. I send you ½ I have and probably shall not be able to procure any more very soon. 15 or 20 specimens were found on a dry hill at Exeter (Otsego Co.) 12 of them in fruit. A few specimens are in the hands of a friend who first noticed it, Dr. Hadley has a specimen and I sent some to Beck 2 years ago (the same summer it was discovered). He has never given an opinion or said a word about it. I do not know that *O. vulgatum* or any other species has been found in this section. It appears to come near *O. pusillum* Nutt. but that species has "frond cordate acute"—this has the frond *acute at the base* and

obtuse at the extremity. These specimens are as large as any that have been found.

If you think it new suppose you publish it. A. G.

Dr. Robinson sent for comparison from the Gray Herbarium the remainder of this same collection. They agreed perfectly with Dr. Torrey's in their immature condition and are labeled by Dr. Gray.

"Depauperate *O. vulgatum*, Exeter, Otsego Co. Dr. Curtiss." Inside the packet are two labels; one reads in Dr. Gray's handwriting.

"*Ophioglossum.* Can it be *O. vulgatum*? I am informed it is constantly of this size."

The other reads "It looks different, but still may be small var. of *O. vulgatum*. It would be desirable to see more specimens."

In searching Dr. Gray's letters I find in his autobiography an account of his early botanizing and collecting from 1828–1830, and that he speaks of showing plants that puzzled him to Dr. Hadley, and of beginning a correspondence with Lewis C. Beck, of Albany, and Dr. Torrey. While at Utica he spent one summer vacation collecting "down the Unadilla to Pennsylvania." The Unadilla is one of the northern tributaries of the Susquehanna, and forms the western boundary of Otsego County, where these ferns were collected by Dr. Curtiss. From the letters it would seem to have been about 1830. None of these specimens are more than 7 cm. high, the petioles 3–5 cm., the blades 2–3 cm. long by 5–10 mm. wide, lanceolate or oval, and the fertile spike is still so undeveloped that it is not more than half the length of the blade, and nearly sessile. Only two specimens at all like these have been seen from Europe, and they were found in Dr. Gray's and Prof. Eaton's herbaria, collected by Blytt at Christiania, Norway, and are labelled *O. vulgatum*. Some of them resemble the young sterile fronds of *O. arenarium*, especially those which do not bear any fertile spikes, yet the probability is that they are immature *O. vulgatum*, as similar specimens have been collected in May and June by Stewart H. Burnham at Vaughns, N. Y., and Alvah A. Eaton at Seabrook, N. H.

In the Herbarium of William H. Leggett, there were two sets of specimens collected by Mrs. Lucy A. Millington and a letter from her dated from Glens Falls, October 17, 1873, in which she says:

"I have always wished to botanize in North Elba on the sand plains and along their swamps. The sand is nearly white in some places and curiously enough there are heavy forests of deciduous trees there as well as some of larch and stunted Balsams. I enclose all the specimens of *Ophioglossum* I happen to have at present. The smallest are very poor ones, for which you may blame our growing village which runs streets into the very hiding places of our shyest plants, *Mitella nuda*, *Antigramma*, and this small fern nestling in the grass. I might, perhaps, have given you better ones. There is one more form of it which I wished you to see with the rest, where the frond is thick and clumsily shaped as if unfinished. It seems to lack the delicacy and grace of other ferns in a remarkable degree. The North Elba specimen is the first *Ophioglossum* I ever saw and I found but two. The specimens from Glens Falls are poor, as the ground having been constantly travelled over in consequence of a street being opened."

The small, immature specimen from North Elba has a broad oval frond, 2 cm. long by 1 cm. wide, and agrees with the broadest of the small ones collected by Dr. Gray. The specimens from Glens Falls are five in number; the tallest of them is 11 cm. in height with a fertile spike and pedicel 7 cm. long, and they resemble fruiting specimens of *O. arenarium*. She also sent Mr. Leggett a large specimen of *O. vulgatum* from Elizabethtown, N. Y., and she says she has found it more common than she expected.

Various intermediate stages of young *O. vulgatum* have been found in the collections examined. One of these dwarfed specimens was collected by Prof. Eaton at Brattleboro, Vermont; it is mounted with seven others, grading up in size to the normal form. Mr. Canby had one small specimen collected at Gilmanton, New Hampshire, by Joseph Blake, and two others from Norway, Maine, collected by S. I. Smith, which are much smaller than normal. Prof. Engelmann had specimens collected by E. Durand at Bethlehem, Pennsylvania, in 1853, with small lanceolate fronds, most of the plants, however, were immature; and Mr. Newlin Williams has collected in low damp woods with *Habenaria lacera*, at Solebury, Bucks Co., Pa., two specimens which are taller and larger than *O. arenarium*, but have the lanceolate leaves and narrow venation of that species. Prof. Macoun has collected on Prince Edward Island, in wet pastures near the sea, four small leathery specimens, which approach *O. arenarium* in size and shape, but five

others from the same locality show them to be *O. vulgatum*. Prof. Underwood has collected at Baldwinsville, N. Y., a set of young specimens of *O. vulgatum*, on June 14, 1890, part of which he pressed and the rest he cultivated in the laboratory until they matured. The smallest ones, with the shortest petioles and pedicels, had the blade almost round, like those of Dr. Gray and Mrs. Millington. He also has specimens from White Lake, Jamesville, New York, and West Goshen, Connecticut, which might well be taken for *O. arenarium*, but at the latter station he found all the intermediate forms which connect with *O. vulgatum*. In fact, his herbarium is rich in uncommon and intergrading forms of this species. I have seen one set of small European specimens which are intermediate between *O. vulgatum* and *O. arenarium*, and these were collected near Venice by Rigo, and have small ovate-lanceolate blades, and none of them exceed 14 cm. in height.

Mr. Willard N. Clute called my attention to the notes in the Linnaean Fern Bulletin, and told me that at the time that *O. vulgatum* was distributed to the members of the Fern Chapter, he had been struck by the great variation in the size of this fern. I wrote to Mr. Stewart H. Burnham, of Vaughns, N. Y., who kindly sent me a very interesting series of variations, the youngest of which, collected in May, 1896, are the exact counterpart of Dr. Gray's small specimens from Exeter. He also collected on July 7th, in a limestone pasture, small double specimens very closely approaching the Italian specimens collected by Rigo. Other specimens from the edge of the swamp and from beech woods are the large elliptical and oblanceolate forms of *O. vulgatum*. One of them is remarkable for the extreme elongation of the fertile spike beyond the sporangia.

One of the most marked characteristics of *O. arenarium*, aside from its habitat, is its habit of growing with usually two fronds from the same rootstock. This has also been observed in specimens of what appear to be *O. vulgatum*, though, in four out of seven cases noted, the blades of the sterile frond, whether bearing fertile spikes or not, are much reduced in size and venation, becoming either short or oval, as in Chapman's specimens from Florida, and Canby's from Pennsylvania, or else bearing one normal frond and another much narrower. Prof. Eaton, however, had

one double plant from Brattleboro, Vermont, with two large normal fronds, and Austin collected similar specimens at Closter, New Jersey. Prof. Macoun, however, found two and three fronds together on grassy banks at Hastings, which are quite unlike *O. vulgatum*, and yet are larger than *O. arenarium*.

All these variations suggested an inquiry as to what might be considered typical *O. vulgatum*. The description in Gray's manual reads: "Sterile frond (in the N. American form) obovate or ovate with a tapering sessile base and mostly borne below the middle of the stalk of the fertile spike." The figures given in the Manual show a large ovate-lanceolate sterile frond, 6 cm. long by 3 cm. wide. Very few American specimens have been seen which agreed with this figure, but they have been collected by Alvah A. Eaton in New Hampshire, Alfred Commons in Delaware, McCulloch in New Brunswick and Austin in New Jersey. The commonest form throughout the Northern and Eastern states, however, is like the figure given by Prof. Eaton in his Ferns of North America, which he describes as "sterile segment fleshy, sessile near the middle of the plant, ovate or elliptical, one to three inches long." His figure shows an oblanceolate frond, blunt at apex and tapering to a long narrow base. Elliptical fronds also are common, and the figure given in the Linnaean Fern Bulletin for October, 1896, fairly represents a common American variation. None of the oblanceolate fronds have been seen from Europe, though shorter and broader oval fronds occur on both continents, as well as the longer elliptical ones; a broad, blunt and distinctly ovate form is also common to both. Linnaeus describes the frond as ovate and cites Plumier's figures, which, unfortunately, I have not been able to see. The common European form, however, seems to be more acute and ovate-lanceolate, with an amplexicaul base, and is, therefore, often carinate; in American specimens it is very rare to find a leaf that is keeled owing to the tapering flat base. Specimens seen from England, France, Germany, Hungary and Switzerland are all broadest just above the base, and taper to an acute apex.

The venation varies according to the size and shape of the frond; in the ovate and oval forms the short marginal areolae, each with a single short, free veinlet, are more numerous; in the

elongated elliptical or oblanceolate forms the long narrow central areolae without any free veinlets, are more numerous. The immature and smallest fronds are more fleshy and the venation less distinct, the areolae much smaller, with seldom any free veinlets. In some fronds there is rarely a distinct or continuous midvein, somewhat stronger than those on either side, but in most fronds the central part of the leaf is marked by the extremely elongated and approximate narrow areolae.

In size Prof. Eaton says they vary "from two to twelve inches." Two inches would only include such very young forms as those collected by Dr. Curtiss at Exeter and Blytt's from Christiania. The usual size varies from 6–16 inches and the relative length of the stalk above and below the leaf also varies, the younger ones being longer below; for, as the plant matures, the fertile spike elongates and often exceeds the common petiole below the leaf. In *O. arenarium* it is 2–3 times longer, the petiole being quite short and immersed; this is true also of the small European specimens in the Gray Herbarium collected near Venice by Rigo, and of Macoun's multiple specimens from Hastings.

Prantl admits that the spores vary in size and the number of meshes, the largest specimens bearing the largest spores with the greatest number of meshes, but he says he has found similar spores on smaller double specimens. I have not found any American spores having as few areolae (6–12) as he describes in *O. vulgatum;* ours often have as many as 25–30 areolae on one surface of the spore, and the outline appears as a series of indentations rather than a papillose surface, as seen in the European specimens. I have found that in *O. arenarium* the surface is marked by irregular warty protuberances, almost all traces of the polygonal areolae of *O. vulgatum* being lost, and the surface less regularly pitted like a thimble as it is in *O. vulgatum.* I have also seen small forms of *O. vulgatum* approaching *O. arenarium* which had the spores like the former.

O. vulgatum has a wide geographical range, having been collected at various stations in Europe, and also showing much variation according to Prantl. It has been found in Western Asia; Prantl has not credited it to Japan, but there is a specimen in the Gray Herbarium collected in 1891 in Japan, which certainly

resembles the smaller, ovate-lanceolate forms of Europe. Prof. Eaton gives the range as follows: "Canada and New England to Texas and Arizona, also Unalaska, Europe, Asia, Madeira and the Azores." All the specimens from Texas and Arizona thus far seen have been found to be *O. Engelmanni.* I have not seen any of the Madeira specimens which Prantl describes as smaller, and approaching *O. lusitanicum.* The Azores specimens sent to me by Prof. Trelease and listed by him as *O. vulgatum polyphyllum* (8th Rept. Mo. Bot. Gard., 175. *t. 64*) have been variously recognized as a good species under the names of *O. polyphyllum* and *O. Azoricum.* They resemble our *O. pusillum* and are certainly quite as distinct. *O. vulgatum* has been collected in four Canadian stations by Macoun and Dawson; it is common in New England, and becomes rarer southward, through New York, New Jersey, Pennsylvania and Maryland, overlapping the range of *O. Engelmanni* in Virginia, Tennessee, Kentucky and Indiana. Several smaller, ovate forms have been collected in Louisiana and Florida by Hale and LeConte, and Blasdale has collected what appears to be this species in California. The specimens from Unalaska are either some unknown Asiatic species, or a new species of the *O. reticulatum* group, in which I here describe them as *O. Alaskanum.*

In habitat the North American stations vary from open woods, dry pastures, worn out mowing fields to boggy places with *Arethusa* and *Pogonia ophioglossoides.* In dry pastures it is stunted, in wet grassy places it is larger and less rigid. It is likely that most of the stations recorded in the Fern Bulletin by Miss Price from Kentucky, in dry open cedar woods belong to *O. Engelmanni,* as do all those from sterile and rocky hillsides in the Central and Southwestern States.

Prantl, in his monograph, recognizes 29 species, of which 8 have thus far been found in the United States; 27 of these are in the *Euophioglossum* section with entire sterile fronds, and all our species except *O. palmatum* of Florida belong to this section. The following key has been modified and adapted from his to include only the North American species:

I. EUOPHIOGLOSSUM.—Sterile frond simple, fertile spike 1.

PARANEURA.—Sterile frond with several equal parallel veins at base, midvein seldom if at all branched, though generally anastomosing with the lateral veins by short oblique veinlets, often disappearing below the apex.

A. *Vulgata.*—Frond large, ovate to elliptic, basal veins 9–13.

Apex obtuse; areolae narrow with few veinlets. 1. *O. vulgatum.*

Apex mucronate; areolae broad with many veinlets. 2. *O. Engelmanni.*

B. *Lusitanica.*—Frond small, lanceolate; basal veins 3–7.

Plants 5–18 cm. high; peduncle 5–9 cm.; veins 7. 3. *O. arenarium.*

Plants 2–6 cm. high; peduncle 5–15 mm.; veins 3. 4. *O. Californicum.*

PTILONEURA.—Sterile frond with few or several unequal veins at base, midvein branching and generally continuous to apex.

C. *Reticulata.*—Rootstock not thickened; plants 10–30 cm. high.

Sterile lamina ovate or cuneate at base, thin. 5. *O. Alaskanum.*

Sterile lamina reniform or cordate at base. 6. *O. reticulatum.*

D. *Macrorhiza.*—Rootstock thick or globose; plants 3–8 cm. high.

Peduncle from base of the cuneate lanceolate sterile lamina; rootstock tuberous. 7. *O. pusillum.*

Peduncle from petiole; sterile lamina cordate; rootstock globose. 8. *O. crotalophoroides.*

II. CHEIROGLOSSA.—Sterile frond palmately divided, fertile spikes 5–14. 9. *O. palmatum.*

1. OPHIOGLOSSUM VULGATUM L. Sp. Pl. 2: 1518. 1753. Eaton, Ferns of N. Am. 2: 261. *t. 81. figs. 1–3.* 1880. Gray's Manual, 6th Edition t. 20. 1889.

Plants 1–4 dm. high; rootstock cylindric, sometimes quite large and tuberous, bearing 1–3 leaves; petiole partly subterranean, 3–16 cm. long; sterile lamina ovate or ovate-lanceolate, oval or elliptic, most frequently oblanceolate or spatulate, 3–12 cm. long, 1–5 cm. broad; base long and narrow, tapering into the petiole, rarely broad and clasping; apex obtuse or acute, not cuspidate; basal veins 9–11, midvein sometimes slightly stronger, lateral veins approximate and parallel, connected by short oblique veinlets, forming long narrow areolae in the middle of the leaf, and shorter hexagonal ones near the margin and apex with usually one short straight free veinlet; epidermis fleshy and wrinkled in young plants, becoming pellucid when old, with numerous stomata; peduncle arising from the base of the sterile lamina, 10–30 cm. high; spike 1.5–5 cm. long, apex prolonged beyond the sporangia which are in 11–52 pairs; spores .03–.05 mm., reticulated with angular areolae, the ridges between narrow and thickened, making an irregular outline.

Preferring loamy soil in woods or open meadows, occasionally in boggy places or dry hillsides; usually a few scattered plants are found in one locality. Ranging from Quebec and Ontario, south to Florida; also in California. Widely distributed in Europe, Madeira and the Azores and Western Asia, and Japan.

2. OPHIOGLOSSUM ENGELMANNI Prantl.

O. vulgatum Eaton, Ferns of the Southwest, U. S. Geol. Surv. 340. 1878.

O. Engelmanni Prantl, Jahrb. d. K. Bot. Gart. Berlin, 3: 318. *pl. 8. fig. 17*. 1884.

Plants 8–22 cm. high; rootstock cylindric with long brown roots, often bearing 2–3 fruiting and 1 sterile leaf on the same plant with the sheathing base of the old leaves frequently persistent; petiole subterranean or partly exserted, 4–10 cm. long; sterile leaf elliptic or lanceolate-elliptic, obtuse but sharply apiculate, 3–9 cm. long, 1.5–5 cm. broad; fleshy, becoming pellucid when old and dry, slightly paler beneath; basal veins 13 or more, median one slightly stronger and unbranched below the middle of the frond, forking and anastomosing with the lateral ones above; lateral inner veins parallel and approximate, outer ones arcuate-erect; transverse veinlets oblique and large, forming broad oblong-hexagonal areas with numerous anastomosing or free veinlets included; cells of the epidermis flexuous, much elongated in the middle beneath, stomata numerous; peduncle starting from the petiole or the base of the sterile lamina, 3–9 cm. long; spike 1.5–2.5 cm. long, apiculate, sporangia 12–27 pairs; spores .045–.050 mm. in diameter, areolae 15–20, angular, striae not elevated.

Easily distinguished from *O. vulgatum* by the apiculate sterile frond, its broad areolae with numerous anastomosing veinlets and its shorter peduncle. Type locality in damp sterile places in the higher valleys at Comanche Spring, Texas, Lindheimer, May, 1849, no. 53. Also common on stony prairies, but very rare there with spikes; on rocks, in cedar woods near New Braunfels, Texas, Lindheimer, May, 1850, 414. It was distributed as *O. vulgatum* var. in E. Hall's Plantae Texanae, from low grounds Houston, April 16, 1871, no. 858. It had first been collected on arid rocks near the Mississippi at Jefferson Barracks, Missouri, by Riehl, May, 1841, 242; Allenton, Mo., G. W. Letterman, June, 1875; Springfield, Mo., E. M. Sheperd, 1879; Rocky hillsides, Eggert, May 31, 1887; Independence, B. F. Bush, May, 1894; 813–822; Calcareous soil, Natchitoches, Louisiana, April, Dr. Hale; wet and shady ground, 4500 ft. alt. Sanoita Valley, Arizona, Dr. Rothrock; on lime rocks, Tanner's Canyon, Huachuca mountains, Arizona, J. G. Lemmon, August 29, 1882; damp places on mesas around Mustang moun-

tains, Arizona, C. G. Pringle, September 13, 1884. It was also distributed as *O. vulgatum mucronatum* by G. D. Butler, in 1875, from Indian Territory below the Arkansas and Red River and is abundant at the highest elevations of the Sierra de San Francisquito, Lower California, T. S. Brandegee, October 18, 1890; on the flat top of a limestone ledge in northwest Arkansas, April, 1880, F. L. Harvey; moist spot in the cedar glades at Lavigne, Tennessee, A. Gattinger, May 16, 1882; dry open woods and cedar groves, Bowling Green, Kentucky, Sadie F. Price. An unusually large and deformed specimen was collected by Prof. Underwood on the campus of Indiana University at Bloomington, Indiana, June, 1893, and W. Alphonso Murrill has collected it this year at Staunton, Virginia.

3. Ophioglossum arenarium n. sp.

Plants 5–18 cm. high, rootstock slightly thickened, bearing 1 or often 2 fertile plants and large fleshy roots; petiole 1–4 cm. long partially or rarely entirely subterranean; sterile lamina 2–5 cm. long, 5–12 mm. wide, lanceolate with a long tapering base, apex obtuse, rarely acute or apiculate, fleshy becoming wrinkled when dry, not pellucid; basal veins 5–7, the median straighter and distinct almost to apex, the lateral more or less parallel and connected by short oblique veinlets, forming long narrow areolae in the centre of the leaf with a few faint free or anastomosing veinlets, and much shorter irregular areolae toward the margin; epidermal cells sinuous, stomata numerous; peduncle arising from the base of the sterile lamina, 5–9 cm. long; spike 1–3 cm. long, often twisted, apiculate with 12–26 pairs of sporangia; spores .04–.05 mm. in diameter, reticulations indistinct or completely obliterated in the ripe spore by numerous minute irregular thickenings, forming a warty surface.

Gregarious in a single colony of hundreds of plants, forming a patch five feet in diameter, of a yellow color when mature, growing not far from the beach, under oaks, cedar and holly in sandy soil at Holly Beach, New Jersey, July 3, 1897, discovered by Joseph Crawford and Charles L. Pollard.

4. Ophioglossum Californicum Prantl.

O. vulgatum Cleveland, Bull. Torr. Club, 9: 55. 1882.

O. Californicum Prantl, Jahrb. d. K. Bot. Gart. Berl. 3: 315. *pl. 7. fig. 11.* 1884.

O. nudicaule L. fide Davenport, Bull. Torr. Bot. Club, 9: 71. 1882.

Plants small, only 2–6 cm. high; rootstock cylindric, tuberous, elongated with numerous large roots; leaves 1–2, sheathed at base by the old ones of the previous year; petioles entirely subterranean, 1–2 cm. long; sterile lamina 1–2 cm. long; .4–.7 mm. wide, lanceolate or ovate-acute, rarely obtuse, or apiculate; fleshy, rugose when dry; basal veins 3, median the stronger, lateral ones branched; transverse veinlets oblique, forming long narrow areolae with few or no free veinlets near the margin; epidermis wrinkled, cells flexuous, stomata straight; peduncle arising from the base of the sterile lamina, only 5–15 mm. long; spike 5–10 mm. long; sporangia 10–15 pairs, apex short; spores .05 mm. reticulate, areolae 20–25, rounded, striae unequal, not elevated.

In grassy, stony spots upon the high mesa near San Diego, California, Cleveland and Parry, March and April, 1882; also Mesas near San Diego, C. R. Orcutt, no. 212, March 25, 1882. Moist mesas, Lower California, April 10, 1882, C. G. Pringle; near Enemada, Mexico, April 10, 1882, M. E. Jones.

In the herbarium of D. C. Eaton there is a specimen collected by D. Cleveland, ex Herb. George E. Davenport which is labelled *O. nudicaule*, "Rediscovered by Dr. C. C. Parry in March, 1882, after a lapse of thirty-two years. A specimen in the Torrey Herbarium labelled simply "*Ophioglossum* Dr. Parry," is evidently one of the original collection, as Dr. Torrey was not living in 1882, and his specimens differ from the later collections in age and condition. Prof. Eaton had one of Dr. Parry's 1882 specimens, which is very interesting, as the sterile frond is bleached and thin, showing the venation perfectly, and the fertile spike is foliaceous and flattened, also bleached and thin, showing the veins and the cells from which the sporangia originate, with a flat, apical prolongation and immature spores, each with three ridges, radiating like spokes, as figured for other species by D. C. Eaton.

5. Ophioglossum Alaskanum n. sp.

O. vulgatum Eaton, Ferns of N. Am. 2: 261. 1880. ex. p.

Plants 6–12 cm. high; rootstock not seen; petiole subterranean in part, 2–8 cm. long; sterile lamina 2.5–6 cm. long, 2–3.5 cm. wide, ovate or ovate-lanceolate, suddenly dilated above the cuneate clasping base; apex obtuse or acute, not apiculate; frond thin or slightly fleshy, venation distinct; basal veins 9–11, midvein slightly

stronger at base, distinct to apex, usually giving off 1–4 branches; lateral veins divergent from the base, forming regular hexagonal areolae, connected by short oblique veinlets, including several free or anastomosing veinlets; peduncle arising from petiole at the base of the sterile lamina, 3–9 cm. long; spike 5–20 mm. long, apiculate, sporangia 8–21 pairs, spores .027–.035 mm, trivittate, with irregular broken areolae, giving the surface a warty appearance; striae not elevated.

On hillsides in rather well-drained situations, Unalaska Id. Alaska, L. M. Turner. 1878. Distributed as *O. vulgatum* by George E. Davenport from the Massachusetts Horticultural Society, ex herb. J. Schneck. Mr. Davenport has recently sent us some fine specimens showing considerable variation in size and shape, stating that he had long been intending to re-examine this species, as he felt that it was intermediate between *O. vulgatum* and *O. reticulatum*, and that his specimens are marked "probably *O. reticulatum*." They differ from *O. vulgatum* in the branching midvein and divergent lateral veins as well as in the larger areolae with more numerous included veinlets; from *O. reticulatum*, which has not been reported north of Mexico, in the shape of the sterile frond, which is neither cordate nor reniform. Mr. Baker writes from Kew that he cannot separate the Unalaska plant in any way from *O. vulgatum* and that he looks on *O. pedunculosum* as a mere variety of that species. I cannot agree with him in either of these opinions.

6. Ophioglossum pusillum Nutt. Gen. : 248. 1818.

O. nudicaule Sturm in Mart. Fl. Bras. fasc. 23. 144. In part, not L.

O. tenerum Mett. fide Prantl. l. c. 322. *t. 8. fig. 23.* 1884.

Plants 2–9 cm. high; rootstock short, slightly thickened, bearing 2–7 fronds; petiole very short, 5–15 mm. long, subterranean; sterile lamina small, 5–15 mm. long, 5–9 mm. broad, cuneate-lanceolate or ovate, acute or acuminate, rarely broadest at the base; basal veins 3, midvein distinct to apex, branching by lateral veinlets which form narrow areolae with no free veinlets; epidermis wrinkled when dry, stomata numerous; peduncle arising from the base of the sterile lamina, 2–6 cm. long; spikes 5–10 mm. apiculate, sporangia 6–14 pairs; spores .030–.032 mm., 3-ridged, slightly and indistinctly roughened.

Type locality in South Carolina, Nuttall; sandy hills near the Savannah River, Georgia, Beyrich; sandy pastures near Mobile. Alabama, Charles Mohr, October and November; Apalachicola

and Campbellton, Florida, Chapman; on damp sand along the margins of pine barren ponds, Levy Co., 1877, and near Rosewood, Florida, A. P. Garber, November, 1877; Ocean Springs, Mississippi, S. M. Tracy; New Orleans, Louisiana, Drummond, 1833.

A minute species ranging through the Southern and Gulf States to Mexico and Cuba, also in Guiana and Brazil, though many of the larger specimens in the herbarium of D. C. Eaton and probably at Kew, are referable to other tropical American species. A specimen in the herbarium of Prof. Underwood, collected in "Moist places in the Sierra Madre Mountains, Chihuahua, Mexico, by C. G. Pringle, Oct. 21–30, 1887," is certainly not this species. It is much larger and the venation is quite different. It is probably undescribed. There has been much confusion as to the proper name for this species. *O. nudicaule* L. belongs to an African species collected at the Cape of Good Hope by Thunberg, and Prantl enumerates five authors who have applied the name to seven different species, and concludes that our North American specimens should be known by a manuscript name *O. tenerum* of Mettenius. Eaton and other American authors have discarded *O. pusillum* Nutt., because he describes the frond as cordate. Some notes by J. H. Redfield in the Eaton Herbarium made from Nuttall's types at the Philadelphia Academy of Sciences, prove, however, that his specimens of *O. pusillum* are what we have been calling *O. nudicaule*, and he says that it is "scarcely ever more than an inch high." Besides he enumerated *O. bulbosum*, of which *O. pusillum* has been considered a synonym, as a distinct species.

7. OPHIOGLOSSUM CROTALOPHOROIDES Walt. Fl. Carol. 256. 1788.

O. bulbosum Michx. Fl. Bor. Am. **2**: 276. 1803.

Plants 3–12 cm. high; rootstock globose, large, often 1 cm. in diameter, bearing few slender roots, and several fronds; petioles subterranean, 1–3 cm. high; sterile lamina 1–3 cm. long, .5–2 cm. broad, concave or carinate, broadly ovate and cordate at base, apex acute; basal veins 5, midvein slightly stronger, rarely branched and continuous nearly to apex; lateral veins freely anastomosing, forming short hexagonal areolae with no or rarely one free veinlet; peduncle slender, 1–9 cm. long, arising from the petiole; spike short, broad, 3–10 mm. long, apiculate; sporangia 4–11 pairs; spores .05 mm. diam., reticulate with raised ridges.

Carolina, Walter, l. c.; and "Bosc. Hb. Willd., no. 19422" fide Prantl; South Carolina, Michaux; Summerville, S. C., Constance G. DuBois, April, 1889; Fernandina, Florida, C. E. Faxon, 1873; Manatee, A. P. Garber, March, 1878; Apalachicola, Chapman, February, 1883; New Orleans, Louisiana, Drummond, 1832; Alexandria, Dr. J. Hale; Jackson, Dr. Ingalls, 1835; Mobile, Alabama, Chas. Mohr, 1844; Auburn, L. M. Underwood, March, 1896; Enterprise, Miss., S. M. Tracy, March, 1897; Houston, Texas, E. Hall, March, 1892. This species ranges south into Mexico, Caracas, Bolivia, Chile to Argentina, and has been credited to "Wet Pine barrens of New Jersey" ("Pursh"), in Barton's Flora N., of N. America, and Wood's Class-Book, though this is probably a mistake.

8. OPHIOGLOSSUM PALMATUM L. Sp. Pl. 1518. 1753; Eaton, Ferns of N. Am. 2: 269. *t. 81. figs. 11–14.*

Cheiroglossa palmata Presl. Suppl. 57. ?

Plants 2–3 dm. high, bearing several fronds from a thick scaly rootstock; petiole 6–20 cm. long, blade 10–20 cm. long, usually palmately divided into 2–9 broadly spreading segments, rarely simple and lanceolate; basal veins 5–8, repeatedly branching and anastomosing, forming long hexagonal areolae without any free veinlets; peduncles arising from the petiole and the base of the sterile lamina, 1–16, short, 1–2 cm. spike 1–3 cm. long; sporangia 15–40; spores .06 mm., reticulations angular, striae slightly elevated.

A tropical species usually found on palms and palmettos in Florida, Caloosahatchee River, Chapman, 1875; hummocks of the Caloosa River, A. P. Garber, 1878; Indian River, Mary C. Reynolds, 1879; Chuckalaskee, E. W. Reasoner, 1887; Manatee, L. M. Underwood, 1891. Ranging through Mexico, and the West Indies, to Brazil.

Description of Plates.

Plate 318. Drawn by Mr. Walpole under the supervision of C. L. Pollard. *Ophioglossum arenarium*, n. sp., E. G. Britton.

Plate 319. Drawn by F. Emil under the supervision of E. G. Britton. Venation of fronds in ½. 1. *O. vulgatum.* 2. *O. Engelmanni.* 3. *O. arenarium.* 4. *O. Californicum.* 5. *O. Alaskanum.* 6. *O. reticulatum.* 7. *O. pusillum.*

New or otherwise interesting Plants of Eastern Tennessee.

By T. H. Kearney, Jr.

The following notes relate, for the most part, to a collection made by the writer during August and September, 1897, in Cocke county, Tennessee. Most of the material was collected about Wolf Creek Station, and between that point and Lemon's Gap, as well as along the French Broad between Paint Rock and Del Rio. The highest elevations visited were The Bluff and Max Patch Mountains, both about 1400 m. high. Along the French Broad near Wolf Creek the height above sea-level is probably not much over 600 M.

Tradescantia montana Shuttlw.; Britton & Brown, Ill. Fl. 1: 377. 1896.

Common about Wolf Creek, and the only species observed there. Two well-marked forms were noted, both growing on rather fertile soil in open, hillside woods. In one the stems are several from one root, slender, rather flexuous (but not strongly zigzag as is usually the case in *T. pilosa*), about 3 dm. high, and the largest leaves are 15 cm. long and about 1 cm. wide. In the other form the stems are usually solitary, stout, not flexuous, attaining a maximum height of 9 dm., and the largest leaves measure 25 cm. long and 2 cm. wide.

Disporum sp.

Fruiting specimens of a *Disporum* were collected near Wolf Creek Station (no. 917) but whether of *D. maculatum* (Buckl.) Britton or of *D. lanuginosum* (Michx.) Nichols., I am unable to decide. Distinct as the two species are when in flower, I can nowhere find any characters given for differentiating them when in fruit. Careful study of the two species in the field, localities for each having first been accurately marked while the plants are in flower, may bring to light characters that will serve to distinguish them later in the season.

Celtis pumila Pursh, Fl. Am. Sept. 200. 1814.

Grows on dry sandstone cliffs along the French Broad River

near Wolf Creek (no. 886), accompanied by *Philadelphus hirsutus* Nutt. and *Pentstemon Smallii* Heller. The fruit, at that time (Aug. 25) apparently quite mature, was of a tawny yellow, and did not darken at all in drying. The largest stem noted was about 1 cm. in diameter just above the ground. The maximum height was about 1 m. The leaves do not agree in one particular with Pursh's description: they are extremely scabrous above, while Pursh says "foliis utrinque glabriusculis."

BUCKLEYA DISTICHOPHYLLA (Nutt.) Torr. Am. Journ. Sci. 45: 170. 1843.

A number of plants were encountered during the past season growing in rather dry soil on a wooded bluff on the French Broad River between Wolf Creek and Paint Rock, fully 30 m. above the river. I have not before seen *Buckleya* growing so high above the surface of the water. The plants were less vigorous than those nearer the bank. The bushes everywhere fruited abundantly last season, while in 1896, I was told, scarcely any fruit could be found.

SILENE OVATA Pursh, Fl. Am. Sept. 316. 1814.

Quite abundant in places near Lemon's Gap, Cocke County (alt. about 1200 m.) growing in fertile soil in a thicket of *Rubus villosus* Ait. at the roadside, elsewhere in open woods (no. 617). In full flower Sept. 3–8. The plant has a strong and rather disagreeable odor. The largest specimen seen was 16.5 dm. high and the maximum diameter of the stem was very nearly 1 cm. The root-system is strongly developed, many of the fibers being much thickened and thus giving the plant an unusually firm hold on the soil.

CIMICIFUGA RUBIFOLIA n. sp.

Cimicifuga cordifolia Torr. & Gray Fl. N. Am. 1: 36. 1838–40, in part?—Not Pursh.*

A tall long-lived perennial, with hard knotted rootstocks and solitary wand-like stems bearing one, or more often two, large biternate leaves near the base. Rootstock thick, horizontal, attaining a maximum length of 8 cm., bearing numerous strong root-fibers; stems 6–14 (mostly 10–12) dm. high, erect, rather stout

* Fl. Am. Sept. 373. 1814.

UofM

at base, but diminishing rapidly towards summit, usually dark brown-purple, rather acutely 4-angled below, almost terete towards summit, more or less sulcate on the faces, especially below, smooth and glabrous or with a few lax delicate hairs up to the inflorescence, there very sparsely to rather densely puberulent or short-pubescent; petioles 2–4 dm. long, rather stout, straight or somewhat arcuate below, angled, rather deeply sulcate on the upper face towards base, rather densely pubescent in the groove, otherwise nearly glabrous or sparsely pubescent, with lax hairs especially towards summit, somewhat dilated at apex, much enlarged and with thin wing-like margins clasping the stem at base; leaves biternate, the terminal division usually consisting of a single leaflet much larger than the others, but occasionally trifoliolate, the lateral divisions always trifoliolate; petiole of terminal division 10–12 cm. long, angled and sulcate like the main petiole, sparsely pubescent with lax delicate hairs, the groove densely so; petioles of lateral divisions 6–9 cm. long, equal or one as much as 2 cm. longer than the other; petiolules of lateral leaflets of terminal division (when present) about 5 mm. long, deeply sulcate on the upper face, very pubescent, especially in the groove; petiolules of leaflets of lateral divisions shorter, otherwise similar; terminal leaflet of terminal division 10–20 (mostly 15–16) cm. long, 12–20 (mostly about 15) cm. wide between the apices of the two largest lobes, very broadly obovate in outline, equilateral, sharp acuminate at apex, deeply cordate with a sinus of equal width throughout or widening towards the mouth, coarsely and irregularly dentate, deeply and acutely palmately three-lobed, the primary lobes themselves less deeply 2–3-lobed and the secondary lobes in turn slightly 2–3-lobed, thin, dark green above, paler beneath, smooth and glabrous above, sparsely short-ciliate, sparsely to rather densely pubescent along the veins beneath with rather long, appressed, delicate, lustrous hairs, very veiny, the veins prominent, especially below, strongly tending to anastomose, the two largest lateral ones nearly as strong as the midvein; other leaflets smaller and inequilateral, otherwise similar; inflorescence a simple panicle of 2–4 slender racemes, the terminal and much the longest one 15–30 (usually about 20) cm. long; rhachis and pedicels sparsely, or the pedicels occasionally rather densely pubescent with short straight hairs; pedicels (in flower) about 2 mm. long, rather slender, much thickened at summit, subtended by a lance-subulate bract about 2 mm. long, bearing at base 2 laterally disposed, ovate-triangular, acute, ciliolate bractlets about 1 mm. long, pedicels (in fruit) 4–5 mm. long; sepals 5, fugacious, 4.5–5 mm. long, 3–4 mm. wide, rounded at apex, narrowed at base, concave; the three outer obovate-oblong, with about 7 distinct longitudinal veins and obscure cross-veins; the two inner broadly obovate, more deeply concave, thinner in texture and whiter in color, with 5–7 longitudinal veins and dis-

tinct, somewhat reticulated cross-veins; petals none; stamens 35–65; filaments about 4 mm. long, flattened especially towards summit; anthers about .5 mm. long; pistil solitary, sessile, about 2 mm. long from base of ovary to summit of stigma, the style and stigma only slightly differentiated from the body of the ovary; ovary about .7 mm. in greatest transverse diameter, perfectly glabrous, strongly compressed latterly, the sides irregularly oblong in outline; style slightly recurved, very short; stigma minute; pods 8–10 (commonly 8) mm. long, very nearly sessile, strongly compressed laterally with sides irregular oblong, rounded towards apex on the dorsal face, rounded towards base on the ventral face, beaked by the short, blunt, hardened, apically somewhat enlarged, ascending style which departs from the ventral side of the pod, just below the summit, at an angle of about 45°, pale green, walls thin, becoming almost chartaceous, veins prominent, somewhat reticulated; seeds usually 6, the four middle ones in two rows, the other two solitary, about 3 mm. long, about 1.5 mm. wide, lenticular, somewhat flattened laterally, the sides oblong in outline, chestnut brown, covered with pale brown thin chaffy scales, especially along the edges where they form a well-developed deeply lacerate wing.

In rich soil on a wooded bluff along the Tennessee River, near Knoxville, Tennessee, where it was collected in flower by the writer early in September, 1890, and 1891, and in fruit by Prof. A. Ruth in October, 1897. The large terminal leaflet suggests the leaf of *Rubus odoratus* L.

A very distinct species of the Section *Actinospora*, most nearly allied to *C. Americana* Michx. though apparently slightly approaching *C. racemosa* (L.) Nutt. (Section *Macrotys*) in its solitary, sessile ovary, short style and partially two-ranked seeds. However it is most abundantly distinguished from that species by its bibracteolate and much shorter pedicels, much fewer stamens with filaments one-half as long and anthers one-half as large, thin-walled pods about twice as large and chaff-covered, lenticular seeds. From *C. Americana* our plant is differentiated by the following characters: bractlets of pedicel always basal (in *C. Americana* usually borne near middle of pedicel); pubescence of inflorescence rather sparse and straight, not glandular (in *C. Americana* dense, glandular, almost granular); petals none (in *C. Americana* the usually two, obovate, deeply lobed, cucullate petals are characteristic); shorter filaments (about 7 mm. long in *C. Americana*); smaller anthers (7 mm. long in *C. Americana*); sessile, solitary ovary; much shorter and straighter style; much shorter beak to

the pod; and partially two-ranked seeds. From both of our well-known eastern species *C. rubifolia* differs in its biternate leaves with commonly unifoliolate terminal division, in the cut of the large, very broad, deeply cordate leaflets and in the characteristic appressed pubescence along the veins on the under leaf-surface.

Cimicifuga cordifolia Pursh is almost certainly a form of *C. Americana* Michx. Pursh's description is clearly meant for that species and he cites Michaux's name as a synonym. It is not probable that Pursh would have omitted from his Flora a plant that must have been so familiar to him as this common species of the Southern Mountains. The plant figured in Curtis' Botanical Magazine,* has much the leaf of *C. rubifolia*, but is described as having "the nauseous smell of its relatives" and "flowers in June and July." *C. rubifolia* is like *C. Americana* in its total lack of odor and its autumnal flowering. It is more likely that Curtis had a form of *C. racemosa* with broad, cordate leaflets, such as is represented in the National Herbarium by a specimen from East Tennessee, of C. C. Parry's collecting. It was doubtless some such form that Dr. Gray had in mind when he reduced *C. cordifolia* to *C. racemosa* as a variety. The description of *C. cordifolia* in Torr. and Gray may possibly include *C. rubifolia*, although this is not probable. Indeed, it is not easy to imagine upon what that description was based. Pursh's characters certainly give no warrant for the assumption that his plant had sessile ovaries.

HEPATICA ACUTA (Pursh) Britton, Ann. N. Y. Acad. Sci. 6: 234. 1891.

A specimen collected near Wolf Creek bears one normal leaf and another with rounded lobes, exactly as in our second American species. Dr. Gattinger collected a similar plant on the Big Frog Mountain, in Polk County. Dr. Charles Mohr informs me that he finds such plants occasionally in the mountains of Alabama, and that they are referrable to *H. acuta*. In East Tennessee the color of the sepals affords a good character, those of *H. acuta* being pale rose-purple or lavender, while in the other species they are always some shade of blue.

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* 46: *pl. 2069.* 1819.

CARDAMINE PARVIFLORA L. Sp. Pl. Ed. 2, 914. 1763.

Common in dry upland woods about Knoxville, often appearing where the woods have been burnt over.

ITEA VIRGINICA L. Sp. Pl. 199. 1753.

Collected near Wolf Creek Station (no. 720), growing on a shaded ledge of sandstone along the French Broad River, an unusual habitat for this plant, which ordinarily makes its home in low swamps. The specimens were small, the largest not more than 1 m. high, but seemed otherwise typical.

AGRIMONIA MOLLIS BICKNELLII n. var.

Agrimonia mollis (Torr. & Gray) Britton var., Bicknell, Bull. Torr. Club, 23: 517. 1896.

Collected in the neighborhood of Wolf Creek, September 2d, (no. 691) where it grew in similiar situations with the type, but was more common. Mr. Bicknell's excellent characterization leaves nothing to be added, and certainly indicates that this plant should have a varietal name. As Mr. Bicknell points out, the development of tubers is stronger than in *A. mollis*, and the tubers form on shorter roots. It is rather difficult to secure specimens of *A. mollis* that show completely the tuber development, but with var. *Bicknellii* a vigorous pull is enough to bring the plant up with a number of tubers attached. The two forms are much more obviously distinct in the living state than in herbaria. It does not seem that the existence of intergradations should be regarded as an obstacle to the publication of a variety, when the majority of the specimens are so well-marked.

GEUM FLAVUM (Porter) Bicknell, Bull. Torr. Club, 23: 523. 1897.

A few specimens with nearly mature fruit were found in deep rich mountain woods along Wolf Creek, August 23, 1897 (no. 686), growing with *Agrimonia hirsuta* (Muhl.) Bicknell. This easily recognizable and very distinct species is here reported for the first time from the Southern States.

STYLOSANTHES RIPARIA n. sp.

A perennial herb, with few or several (sometimes 8) stems from a deep, strong, woody root, which attains a maximum length of 3 dm.

Stems 1–3.5 (commonly 2–2.5) dm. long, decumbent, wide-spreading, much branched, slender, the somewhat elongated internodes with a usually well-defined line of rather tomentose pubescence decurrent from the base of the stipules; petioles very pubescent, only slightly exserted from the stipular sheath, the exserted portion about 1 mm. long; stipules large, the tube 3–5 mm. long, inflated, thin, membranous, brownish, appressed-pubescent, terminating in two subulate, aristate, more or less reflexed teeth about half as long; leaves spreading, pinnately trifoliolate, rhachis 1–2 mm. long, pubescent, petiolules very short; terminal leaflet (of leaves of main stem) 10–18 (commonly 12–15) mm. long, 4–8 mm. wide, broadly or narrowly elliptical, oblanceolate or even cuneate-obovate, usually rounded at apex (sometimes truncate or even slightly retuse), conspicuously subspinescently cuspidate, acutish at base, entire, thickish, dark green above, pale beneath, smooth and glabrous, with a very few short marginal hairs; midrib impressed above, prominent beneath, veins prominent on both surfaces but especially beneath, 10 or 12 in the larger leaflets, departing from the midrib at a very sharp angle, veinlets obscure; lateral leaflets somewhat smaller; inflorescence consisting of leafy bracted compound spikes, composed of 1-flowered bracted spikelets; spikes usually terminating the main stems and most of the branches, about 6 flowered, the two or three uppermost and one or two lowest flowers ordinarily abortive; lower primary bracts commonly unifoliolate, the teeth and leaflet sparsely cilate with long rather weak setose red hairs, otherwise like the foliage leaves; upper primary bracts with gradually reduced and finally almost aborted leaflet. Secondary bract borne upon the short secondary axis,* which is adnate to the midnerve of the primary bract, 3–4 mm. long, entire, lance-subulate, usually broadest near middle and tapering thence to base and acutish apex, subhyaline, whitish, conspicuously ciliate; prophyllum borne on the tertiary axis,† closely approximate to the secondary bract and usually not obviously raised above it, about 3 mm. long, deeply cleft to or below the middle, two-nerved (the second nerve smaller and extending into the lobe), lobe as wide as blade but much shorter, both blade and lobe narrowly linear, rather obtuse or subacute, otherwise like the secondary bract; flower terminating the tertiary axis, short-pedicelled, very slightly raised above the prophyllum; calyx glabrous, conspicuously greenish-veined; tube slender, 3–4 (usually 4) mm. long; limb (from base to apex of lowest (longest) tooth) about 4 mm. long; lowest tooth ovate-oblong, acutish, 1.5 mm. wide, the other teeth shorter and narrower, more obtuse; corolla orange-yellow;

* The "Seitenaxe erster Ordnung" of Taubert.

† The "Seitenaxe zweiter Ordnung" of Taubert, who regards it as arising from the axil of the secondary bract.

vexillum nearly or quite 5 mm. long, 4.5–5 mm. wide; wings nearly 3.5 mm. long, nearly 2 mm. wide, obovate, much narrowed towards base, tooth on vexillar side near base nearly 1 mm. long, oblong, very obtuse, straight; keel about equalling the wings; lower segment of loment very small, infertile; upper segment 3–3.5 mm. long (excluding beak), nearly to quite 3 mm. wide, inequilaterally obovoid, somewhat compressed laterally, strongly gibbous on ventral face, curved toward base and apex on dorsal face, pubescent (rather sparsely when mature) with short curved white hairs, tricostate on both lateral faces (less often bicostate, or tricostate on one face and bicostate on the other), the cross-veins few, reticulated, all strong and dark-green; beak .5–.7 mm. long, stout, strongly hooked (sometimes twice hooked in shepherd's crook fashion), almost central on the summit of the loment; seeds not seen.

In groves of *Pinus rigida* Mill, on the banks of the French Broad River near Wolf Creek, growing in dry, sandy soil, accompanied by *Lechea racemulosa*, *Meibomia viridiflora*, etc.; collected by the writer in August, 1894, and again September 1, 1897 (no. 674).

Belongs to the section *Eustylosanthes* Vog., and is most nearly related to *S. biflora* (L.) B.S.P., from which it is readily distinguished, however, by its more slender, more decumbent culms, smaller leaves with shorter and comparatively broader leaflets, more conspicuously veined calyx with longer tube, vexillum almost always longer than broad (in *S. biflora* almost always broader than long), and longer, broader, obtuse and straight basal tooth to the keel petals. In *S. biflora* this tooth is about one-half as long, slender, acute or acutish and often somewhat uncinate. The best characters, however, are afforded by the prophyllum and the loment. In *S. biflora* some thirty specimens examined showed a prophyllum always perfectly entire, while in *S. riparia* the deep lobing of that organ is equally constant. In *S. biflora* the upper segment of the loment is as long as in *S. riparia*, but it is only about 2.5 mm. wide, and has an irregularly triangular outline in strong contrast to the semi-orbicular outline of the segment in *S. riparia*. Moreover, in *S. biflora* the segment is much more gibbous on the ventral face, but is straight on the dorsal face, thus throwing the beak quite to the dorsal edge of the summit. The beak is usually considerably shorter in *S. biflora* and less

strongly curved. The general aspect of *S. riparia* is much more suggestive of that of a *Trifolium* than in the case with *S. biflora*.

In the terminology of the above description I have followed that of Taubert's excellent Monographie der Gattung Stylosanthes* and have adopted his ingenious view of the morphology of the rather complicated inflorescence. In his generic description (p. 4). Dr. Taubert distinguishes the lower primary bracts from foliage leaves by the absence of lateral leaflets, and notes no exception. In *S. riparia* the lowest bract, even when flower-bearing, is occasionally trifoliate. In one case I found only one of the lateral leaflets present.

ILEX BEADLEI W. W. Ashe; Coult. Bot. Gaz. **24**: 377. 1897.

Collected in flower near Wolf Creek in May, 1893, and in fruit during the past season (633, 633½). Also on Chilhowee Mountain, Blount County, in June, 1893. Seems to be widely distributed and abundant at low elevations in the mountains of East Tennessee.

Mr. Ashe rightly segregates this plant from *I. monticola mollis* (A. Gray) Britton,† but does not point out the characters by which his species can readily be distinguished. *Ilex mollis* A. Gray‡ must be regarded as based upon the northern plant, although Gray confused with it the southern species. *Ilex Beadlei*, however, does not apparently extend into the region covered by Gray's Manual. Hence we must regard as the type of *I. mollis* the plant of the Pennsylvania mountains, which, so far as herbarium specimens show, is a mere pubescent variety of *I. monticola* A. Gray. This, too, may range southward along the higher mountains with the smooth form of *I. monticola*, but is not to be mistaken for *I. Beadlei*. The latter species, as I know it, is found only on the lower hills or down near the river-banks, always in rather dry soil,

* Verhand. Bot. Ver. Prov. Brandenb. **23**: 1–34. 1891.—*S. hamata* (L.) Taubert is here cited (p. 23) as occurring in Tennessee (no. 609 of A. H. Curtiss' distribution). As it did not seem likely that this almost strictly tropical plant should be found so far north and nowhere in the intervening region, I made inquiry of Dr. Robinson, who informs me that two species of *Stylosanthes* collected by Curtiss are deposited in the Gray Herbarium, one (no. 609) being typical *S. biflora* from Tennessee, while the other (no. 609*) is *S. hamata* from Umbrella Key, South Florida.

† Mem. Torr. Club, **5**: 217. 1894.

‡ Man. Ed. 5, 306. 1867.

often growing with *Castanea pumila* Mill. It is distinguished from any form of *I. monticola* by its smaller size (usually about 2 m. high); and smaller leaves which are proportionately broader, shorter, and more abruptly pointed, thicker, firmer in texture, almost tomentose beneath, and of a characteristic light, almost yellow-green color. *I. monticola*, as it occurs in East Tennessee, prefers a rich, comparatively moist soil in deep, shady ravines at higher elevations (1000–2000 m.), where it usually grows as a small tree with slender trunk some 5–7 m. high, and thin, long-pointed leaves of a fine, deep green. It is often accompanied by such plants as *Viburnum alnifolium*, *Cornus alternifolia*, etc. The pubescence on the under surface of the leaf in all specimens of *I. monticola mollis* that I have seen is never so dense as is constantly the case in *I. Beadlei*.

EUONYMUS AMERICANUS L. Sp. Pl. 197. 1753.

Specimens collected along the French Broad, near Wolf Creek (no. 636) have broadly ovate leaves not exceeding 3.5 cm. in length, and mostly about 2 cm. wide. The plants were erect and some 12–15 dm. high, however, and none of the leaves were at all obovate.

VIOLA EMARGINATA (Nutt.) Le Conte, Ann. Lyc. N. Y. 2: 142. 1825.

Specimens of an extreme form of this species, with deeply cut leaves, were obtained near Wolf Creek. I am not aware that this violet has been heretofore reported as belonging to the Southern Flora.

RHODODENDRON MAXIMUM L. Sp. Pl. 392. 1753.

Growing among rocks at the summit of Bluff mountain is a peculiar form, only some 1.5 mm. high, with small leaves about 1 dm. long and 2 cm. wide, the margins inclined to be involute (in the living plant) and the under surface pale brown.

LEUCOTHOË RACEMOSA (L.) A. Gray Man. Ed. 2, 252. 1856.

As far as I know this shrub of the low country swamps has not been reported from the mountain region of the Southern States. I found it last season on the sandy banks of the French Broad River near Wolf Creek (no. 814) and have also collected it along the Emory in Roane County. *L. recurva* (Buckley) A. Gray is

likewise frequent about Wolf Creek, but is confined to rather dry hillside woods.

VACCINIUM MELANOCARPUM C. Mohr, n. sp.

Vaccinium stamineum melanocarpum C. Mohr, Bull. Torr. Club, 42: 25. 1897.

At the summit of Bluff Mountain on the Tennessee-North Carolina line just south of the French Broad River, I collected during the past season (no. 811) specimens of a *Vaccinium* in young fruit, which Dr. Mohr identifies as his *V. melanocarpum*. The Tennessee plant differs from typical Alabama specimens, however, in its shorter, less pointed and thicker leaves with more prominent and strongly reticulated veins, and in its larger bracts. It is a shrub some 4 dm. high, with gnarled, ascending branches, and grows on the open summit of the mountain, accompanied by such plants as *Prunus Pennsylvanica* and *Sambucus pubens*. So different is its aspect from that of *V. stamineum* that it did not occur to me at first that it was related to that species.

VACCINIUM HIRSUTUM Buckley, Am. Journ. Sci. 45: 175. 1843.

Dr. Small, in a recent number of the BULLETIN,* reported his find of this little-known species at Tallulah Falls, Georgia, as "the first collection since the original discovery by Buckley." But flowering specimens were secured in June, 1891, in the Cade's Cove Mountains of Blount County, Tennessee, by Prof. A. Ruth and the writer. There it grew in some quantity on the dry south slope of the ridge, along with *Baptisia tinctoria*, *Sericocarpus solidagineus*, etc. Dr. Gattinger, in his catalogue,† reports this plant as occurring in the "High Mountains of East Tennessee."

LYSIMACHIA FRASERI Duby; DC. Prodr. 8: 65. 1844.

Found at two or three points along the French Broad River near Wolf Creek (no. 829). About one mile above Wolf Creek quite a number of plants were discovered, growing in a tangled undergrowth of *Rubus villosus* Ait., and *Vitis rotundifolia* Michx., on the river-bank. Many of the plants measured 1.5 dm. in height.

* Bull. Torr. Club, 24: 64. 1897.

† Tennessee Flora 61. 1887.

STEIRONEMA TONSUM (Wood) Bicknell; Britton & Brown, Ill. Fl. N. U. S. 2: 590. 1897.

S. intermedium Kearney, Bull. Torr. Club, 21: 263. 1894.

Specimens collected on the banks of the French Broad River near Wolf Creek, Sept. 1 (no. 830), growing in shaded sandy soil, depart from the type of *S. intermedium* not only in habitat but in having the petioles sparsely ciliate their entire length with short lax hairs. Nevertheless they are unmistakably *S. tonsum*, having the slender habit, smaller leaves with less conspicuous veins, much reduced upper leaves which give the inflorescence the aspect of a bracted panicle, comparatively longer peduncles, and calyx-lobes nearly twice as long as the capsule.

STEIRONEMA TONSUM SIMPLEX n. var.

Stems simple, 2–3 dm. high, slender; petioles short, not more than 15 mm. in length, slender, naked except at the base where a few ciliae occur; leaf-blades 1–4 cm. long, 1.5–2.5 cm. wide, broad ovate, the lowest very small and orbicular, subcordate at base, rather abruptly pointed at apex, thin and bright green; inflorescence a four or five-flowered leafy terminal panicle, occasionally with scattered peduncles from the axils of the upper foliage leaves; calyx-lobes only slightly exceeding the mature capsule (in one case merely equalling it).

A few plants collected on the shaded margin of a mountain-brook near Wolf Creek (no. 831), growing in rather moist, sandy soil, accompanied by *Habenaria clavellata* (Michx.) Spreng.

PERILLA FRUTESCENS (L.) Britton, Mem. Torr. Club, 5: 277. 1894.

Abundant about dwellings at Wolf Creek (no. 874). It was formerly cultivated as a foliage plant, but is now thoroughly naturalized and is spreading rapidly. In this form the leaves are always purple underneath, but it does not agree with Bentham's characterization of *P. ocimoides crispa** (*P. frutescens Nankinensis* (Lour.) Britton), in that the leaf margins are neither crisped nor fimbriate-lacerate.

SCUTELLARIA VENOSA n. sp.

Scutellaria saxatilis pilosior Benth.; DC. Prodr. 12: 424. 1848?

*DC. Prodr. 12: 164. 1848.

Scutellaria versicolor minor A. Gray, Syn. Fl. N. Am. 2: Pt. 1, 378. 1878.* In part, not of Chapm.† nor *S. minor* L.

A small plant with usually solitary stems from a slender creeping rootstock. Stems 5–12 cm. long, erect or ascending, rather acutely 4-angled, pubescent with short, mostly retrorse or recurved white hairs, the pubescence towards the summit glandular, denser and more spreading; petioles slender, pubescent with retrorse appressed hairs, those of lowest leaves 1.5–3 cm. long, spreading or recurved, those of uppermost foliage leaves 1 cm. long or less, ascending; largest (often the uppermost) leaf-blades 3–6 (usually 5) cm. long, 2–3 cm. wide; smallest (usually the lowest) considerably reduced; all broadly ovate, obtuse, cordate with a rather open sinus, coarsely crenate, rather sparsely ciliate with short spreading hairs, pubescent with short appressed hairs on both surfaces, but especially along the veins beneath, thin, bright green above, paler beneath, conspicuously veiny, the veins prominently reticulated and almost rugose beneath; inflorescence a simple solitary terminal raceme (less often a much-reduced, simple panicle) 2–4 cm. long, mostly 10–20-flowered; pedicels 2–3 mm. long, rather stout, glandular-pilose, ascending; bracts barely equalling the pedicels, ovate, obtusish, glandular-pubescent; calyx (in flower) about 3 mm. long, rather densely pubescent; (in fruit) about 5 mm. long, sparingly pubescent, light green; corolla about 15 mm. long, pale blue and white, puberulent; anthers minutely ciliate; nutlets 1 mm. in greatest diameter, globose, strongly depressed.

Growing with *Circaea alpina* L. just below the summit of Bluff Mountain, where it was collected August 28 (no. 873). *S. venosa* is closely related to *S. cordifolia* Muhl. (*S. versicolor* Nutt.) from which it differs in its smaller size, much shorter pubescence of leaves and inflorescence, much reduced bracts and considerably smaller calyx and corolla. *S. cordifolia* is mainly a campestrian species preferring much lower elevations, and is not known to occur anywhere in the region where *S. venosa* was collected. *S. saxatilis pilosior* Benth. may be the same plant, but is not identifiable with any certainty from Bentham's meagre description. It may very well be only a form of *S. saxatilis*.

MELAMPYRUM LATIFOLIUM Muhl. Cat. 57. 1813.

Both this species and *M. lineare* Lam. occur near Wolf Creek,

*S. *rugosa* Wood Class Book, Ed. 2, cited here by Gray as a synonym of *S. versicolor minor*, is unquestionably a form of *S. saxatilis* Riddell, to which Wood himself referred it in subsequent editions of the Class Book.

Fl. S. U. S. 323. 1860.

Cocke County, and there exhibit a wide difference in habitat and period of flowering. *M. latifolium* was collected in May, 1893, growing in deep, rich, moist woods along a mountain brook, and was then in full flower. In September, 1897, I sought for it in the same place, but not a vestige was to be found. At that time, however, *M. lineare* was in full flower, growing on dry soil on the top of Brushy Mountain.

VIBURNUM CASSINOIDES L. Sp. Pl. Ed. 2, 384. 1763.

Along a brooklet near the summit of Max Patch Mountain, (no. 730). The specimens are hardly typical, but differ from *V. nudum* L. in their distinctly crenulate dentate leaves with dull upper surface and peduncles distinctly shorter than the cyme. The same form grows on the summit of Thunderhead, Blount County (alt. about 2000 m.), where it was collected by the writer in June, 1891.

SYMPHORICARPOS RACEMOSUS Michx. Fl. Bor. Am. 1: 107. 1803.

In waste-ground near a house at Lemon's Gap, Cocke County, where a large patch of it is well established and was loaded with its white fruit on Sept. 8 (no. 733).

SOLIDAGO ARGUTA CAROLINIANA A. Gray. Syn. Fl. N. Am. 1: Part 2, 155. 1884.

Numerous specimens of a form of *S. arguta*, probably referable to this variety, collected near Wolf Creek in August (nos. 759, 760) are entirely destitute of rays.

ASTER CURTISII Torr. & Gray, Fl. N. Am. 2: 110. 1841–43.

This beautiful plant is the most common *Aster* near Lemon's Gap, at an elevation of about 1000 m., beginning to flower about the last week in August. It varies from about 5 dm. high, with slender, unbranched stems bearing two or three heads, to a tall, stout, much-branched plant 15 dm. high, bearing as many as 150 heads.

GNAPHALIUM HELLERI Britton, Bull. Torr. Club, 20: 280. 1893.

On very dry hillsides, with *Gyrostachys simplex*, *Buchnera Americana*, *Silphium compositum*, etc., near Wolf Creek, collected Sep-

tember 6 (no. 781). This is a well-marked species when growing, although somewhat difficult to characterize. It is a much lower and more slender plant than *G. obtusifolium* L., of greener aspect, with looser inflorescence and fewer heads. In habitat it is strikingly different from *G. obtusifolium*, which, in East Tennessee and in the mountains of Kentucky, confines itself to low fields and fallow ground, where introduced weeds are most frequent, while *G. Helleri* is found upon the dry ridges, sometimes even on arid sandstone outcrops, amid a purely indigenous vegetation.

XANTHIUM SPECIOSUM n. sp.

A stout much-branched leafy annual herb, about 1.5 m. high. Stem about 2.5 cm. in diameter just above the tumid base, erect, straight below, zigzag above, four-angled, obtusely below, rather acutely above, striate above between the prominent angles, hard and almost ligneous in texture, with greenish cortex, sparsely papillose below with white, rather conspicuous papillae that are often extended into short stout appressed antrorse prickle-like trichomes, strongly hispidulous above with similar trichomes, interspersed with minute ones; petioles rather slender, striate, deeply grooved on upper face, especially towards the enlarged base, strongly hispidulous, minutely pubescent along the groove, the lower ones 10–15 cm. long; leaf-blades (the larger ones 17–20 cm. long, 19–22 cm. wide) very broadly triangular-ovate, rather deeply cordate with a wide rounded sinus which is interrupted by a small triangular portion of the blade included between the two primary side-veins, rather acute at apex, obtusely and not deeply 3–5-lobed, with the primary lobes themselves slightly lobed, obtusely and not conspicuously dentate, rather thick, dull green, paler beneath, strongly papillose, scabrous on both surfaces, hispidulous along the veins and margins, especially beneath, with appressed antrorse prickle-like trichomes, rather thickly besprinkled on both surfaces with minute shining resinous granules, veins and larger veinlets prominent, especially beneath, divergent at a wide angle, the midnerve and the almost equally strong primary side-veins broad, somewhat flattened, strongly striate; flowers not seen; fruiting involucres 2.5–4 cm. long, 2.5–3 cm. wide (including prickles), ovoid, light brown in color, sparsely besprinkled with shining resinous granules, rostrate at apex with two or three very stout, more or less incurved, uncinate or biuncinate beaks 10–12 mm. long, densely aculeate with long stout strongly uncinate prickles (the hook nearly horizontal to very strongly incurved), 8–9 mm. long, the lower retrorse, the middle horizontal, the upper antrorse; both beaks and prickles densely hispid (the former to near the apex,

the latter for ½–⅔ of their length from the base), with broad, flat, sharp-pointed, rather lax, spreading or slightly retrorse hairs, which are elongated-triangular in outline, and gradually diminish in size upward.

Collected by the writer September 16, near Wolf Creek Station (no. 785) where it grows on the sandy bottom-lands near the French Broad River and is almost certainly indigenous.

X. speciosum finds its nearest relative in *X. Canadense* Mill., from which it is distinguished by its great size, larger and proportionately broader fruiting involucres, longer stouter and more closely set prickles, longer and stouter beaks, which are more nearly erect and more strongly incurved towards apex, and longer and larger trichomes on the beaks and prickles. *X. macrocarpum* DC.,* a species not certainly known to occur in the United States, is described by the author as having an oval-oblong fruiting involucre twice longer than broad, which would certainly not apply to *X. speciosum*. Moreover, all probably authentic specimens of *X. macrocarpum* examined showed a strong glandular puberulence upon the involucres. None of the species described by Wallroth and others from North America can be identified with the Tennessee plant.

The whole genus is in need of thorough revision, and nowhere more so than in the United States. The most cursory glance at the material in our larger herbaria is enough to show that *X. Canadense*, *X. strumarium* and *X. spinosum* are by no means the only species in this country. But until the Old World species are better understood, a satisfactory treatment of the genus here is impossible.

SENECIO SMALLII Britton, Mem. Torr. Club, 4: 132. 1894.

Rather abundant on dry banks near Wolf Creek Station, Cocke County, Tennessee, where it was collected by the writer in May, 1893. Here reported for the first time as occurring in Tennessee.

HIERACIUM PANICULATUM L. Sp. Pl. 802. 1753.

The maximum height of this species as given by Gray in the Synoptical Flora is three feet. A plant collected at Lemon's Gap, where it grew in dry upland woods, has a stem-length of 17 dm.

* Prodr. 5: 523. 1836.

A new species of Eucalyptus from the Dakota Group of Southwestern ansas.

By Lester F. Ward.

In a small collection of fossil plants from the Dakota group of Clark County, Kansas, which was made by Mr. C. N. Gould and myself on October 3, 1897, there occur several leaves that belong to the genus *Eucalyptus*. One of these is entirely different from any of the rest and presents a nervation which at once marks it as a new species. Although it is not generally advisable to name species from single specimens, especially from one incomplete leaf, nevertheless, so exceedingly clear is the nervation in the present case, that there is no room to doubt either its generic affinity or its specific distinctness from all other species of the genus. So much of the material that has been called *Eucalyptus*, which has been reported from various deposits throughout the world, is of a doubtful character that it is desirable that any case involving no uncertainty be brought to the attention of botanists and geologists. I regard this as such a case and therefore venture to describe it is a new species of *Eucalyptus*, which I take pleasure in naming for Mr. C. N. Gould of Southwest Kansas College, Winfield, Kansas, who not only accompanied me on this expedition, but served as my companion and guide throughout the entire region, with which he has made himself intimately acquainted.

Eucalyptus Gouldii n. sp.

Leaves slightly falcate, about 7 cm. long and 12 mm. wide 2 cm. above the base, from which point they diminish in both directions, being drawn out into a long point above (tip and base wanting in the only specimen found). Substance of the leaf firm and thick; nervation very distinct, midrib strong, secondaries about 10 on a side, rising at a very acute angle, proceeding in a zigzag course so as to meet one another and anastomose, forming elongated angular areas in two rows, the outer row smaller and bounded on the outer side by a connected series of gentle arches forming a continuous nerve generally parallel to the margin and less than 1 mm. distant from it.

Of all living species of *Eucalyptus* this approaches most closely in its nervation to that of *E. largiflorens*, first described by Baron

von Mueller in the Transactions of the Victoria Institute, 1 : 24, 1854, and figured in his Eucalyptographia, Decade V, 1880.

In the accompanying cut, Fig. 1 represents the fossil leaf and Fig. 2 is a copy of one of the leaves of approximately the same size of *E. largiflorens* Muell., from the plate accompanying the description given in the work already referred to. The substantial identity of the nervation is apparent at a glance. In describing that species in the same work, Baron von Mueller devoted only two lines to the nervation as follows: "Lateral veins extremely fine, diverging at a very acute angle or not very spreading nor quite close, the circumferential vein somewhat removed from the edge." This description is, of course, very inadequate, but it is well known that botanists pay scarcely any attention to nervation and do not take the trouble to acquaint themselves with the proper terminology of the subject.*

We thus have another link in an already long chain of evidence which goes to prove that the Australian Fever Tree has had a long history, and was widely distributed over the globe in Cretaceous and Tertiary time, millions of years before man made his appearance.

Two new Species of Sanicula from the Southern States.

By Eugene P. Bicknell.

In a paper published in 1895,* describing two new species of *Sanicula* from the Eastern States, I hinted my belief in the existence of still a third unrecognized species. The single plant which

* This may be found summed up, with illustrations, in the Century Dictionary, article *Nervation*.

* Bull. Torr. Club, 22 : 351–361.

gave support to this view, more strongly held than expressed, had been found in an afternoon's visit to Lookout Mountain, Tennessee, on June 21, 1894, during a short delay of the train on the way up the mountain. Since that time more complete material has come to hand which shows that the plant is entirely distinct from both *Sanicula Marylandica* L. and *Sanicula Canadensis* L., its nearest allies, with either one of which, however, it might easily be confused by anyone not possessing a true understanding of those species.

From the specimens newly in hand it appears that a year before the Lookout Mountain plant was discovered, Dr. John K. Small had collected precisely the same thing at the base of Little Stone Mountain in middle Georgia, and it now gives me pleasure to connect Dr. Small's name with this new species, more especially since he himself would doubtless have shortly distinguished it had it not been described here.

It seems that a still earlier collection of the plant was made by Mr. S. M. Bain at Jackson, Tenn., in May, 1892 ("No. 302, Plantae Tennessei Occidentalis"). This specimen, although differing somewhat from all the others, is unquestionably to be referred to the same species. The east Tennessee and Georgia plants are closely matched by specimens collected by Mr. George V. Nash in August, 1895, at Tallahassee, Florida, the southernmost point at which the plant has been found.

Sanicula Smallii n. sp.

Root perennial, or possibly biennial; stem 1½°–2° tall, smooth, somewhat striate, simple below, or with one lateral branch, above forking into two widely spreading or ascending naked branches sometimes 8′ long, each bearing an umbel of 2–6 rays; lateral branch sometimes 12′ long, like the stem supporting two slender ray-like umbel-bearing branches; stem-leaves 3–4 up to the involucral pair, slender-petioled, two of them sub-basal on petioles 4′–6′ long; leaf-blades rather small, mostly 3′–4′ wide and 2′–3′ long, sub-coriaceous, dull green, paler on the lower surface and often above along the veins, which are distinctly in relief, reniform in general outline with a deep or shallow sinus, 3-divided or nearly 3-foliolate, the segments close together, the lateral pair deeply cleft or rarely parted; segments obovate or the lateral pair broadly rhomboid, dentate-serrate with short-aculeate teeth, or slightly incised, often cleft into three short lobes at the obtuse

or sometimes acute apex especially on the lower leaves; involucral leaves very short-petioled, 3-cleft or 3-parted, the segments narrower and more acute than in the lower leaves; involucels minute, or sometimes ½′ long; rays of umbel slender, often divaricate, ¾′–1½′ long, jointed to their attachment, sharply striate, the striae often subserrulate-scabrous; a solitary ray or peduncle arises from the fork of the stem bearing a single flower cluster; fruit sessile, subglobose, somewhat compressed, 2½″–3″ high to tip of calyx-segments, spreading across bristles 3″–4″; bristles slender, at the base of the fruit minute but perfectly formed, longer above, the uppermost 1″–1¼″ long, surpassing the nearly erect calyx-segments which are ½″–¾″ long, linear-subulate, rigid and separated by distinct intervals; styles slender, diverging or slightly recurved, little longer than the calyx-segments; pericarp thin; commissural scar narrow, ½″ wide, usually covered with a whitish incrustation; oil-tubes 5, arranged nearly as in *Marylandica* but smaller; seed in cross-section suborbicular, not furrowed dorsally or but slightly so, the inner face medially concave or sulcate; sterile flowers mixed with the fertile, most numerous in the inter-rameal cluster, on pedicels 1″–1½″ long, the sepals ¾″–1″ long, linear-subulate or cuspidate, with a strong medial nerve especially noticeable on the inner side, at full maturity rigidly spreading; petals obovate-oblong, apparently shorter than the calyx segments; roots clustered, very thick or sub-tuberous.

Specimens examined:

Tennessee: Jackson, rich woods, May, 1892, S. M. Bain; in flower. Lookout Mountain, June 21, 1894, E. P. B., rocky woods; in immature fruit.

Georgia: Base of Little Stone Mountain, June, 1893, John K. Small; in fruit. Type.

Florida: Tallahassee, August 7–9, 1895, George V. Nash; in fruit.

This plant, although occupying a position somewhat intermediate between *Sanicula Marylandica* and *Sanicula Canadensis*, is in no way involved with either of these species. From the former it may be distinguished by its smaller size, three-divided coriaceous leaves, the cauline slender-petioled, widely bifurcate stem, shorter-pedicelled sterile flowers, never in separate heads and having divaricate segments, smaller fruit with thinner pericarp and shorter styles.

From *S. Canadensis* it may be known by its mostly simple stem terminating in two elongated branches, each bearing a long-rayed

umbel, thicker leaves and much larger sessile fruit with longer styles.

With *Sanicula gregaria* the species has no close affinity. The minute campanulate calyx of *gregaria* separates it sharply from all our species, while its 5-divided thin leaves, umbellately branched stem and branches, trifoliolate involucral leaves and much smaller longer-styled fruit distinguish it radically from *Smallii*. The branching of *Smallii* is more like that of *Sanicula trifoliata* than any other one of our species, and selected leaves of the two may be closely matched in general shape, but the larger and thinner leaves of *trifoliata* and its oblong short-styled fruit with the remarkable arrangement of the oil-tubes denote its wide difference.

Sanicula Smallii differs from all other eastern species by styles of medium length, frequently styliferous sterile flowers and thickened roots.

In point of this new southern *Sanicula* I have carefully read Rafinesque on his alleged new genus and species "*Triclinum odoratum*," published in 1817 (Fl. Lud. 79). Taken by itself, Rafinesque's specific description would apply with tolerable exactness to our new species, but his generic definition and added remarks, insisting on long styles recurved to the base of the ovary, positively excludes this new species and, strictly taken, all other known eastern species as well. Allowing for possible exaggeration, however, it may be well here to take the opportunity of considering further our long-styled species *Marylandica* and *gregaria*. The specific description alone scarcely bars *Marylandica* unless by the terms "*folius longe-petiolatus*," which is distinctly not the case with the stem leaves of this species. The same objection holds against *gregaria*, while the further characterization of "*foliolus lateralibus bipartitus*," untrue for *gregaria*, describes exactly the condition in *Marylandica* and nearly that in *Smallii*. On the other hand, there are points in the description which apparently could have applied only to *gregaria*. In perhaps the most important of these, however, viz. "*calyx urceolatus 5-fidus*, Rafinesque is himself contradictory, for he concludes by declaring that his genus "differs from *Sanicula* by divided calyx * * * !" Here is a distinction absolutely without a difference, and it would actually seem to require us to believe that Rafinesque's conception of the genus *Sanicula* as

distinct from *Triclinium* was based on the species *Sanicula gregaria.*

So far as is known, *gregaria* is the only one of our species having odorous flowers, but the fragrance is of the faintest and quite unworthy to be compared with the sweet scent of *Reseda odorata* with which "*Triclinium odoratum*" is credited.

Upon the whole, therefore, we have every reason to believe that "*Triclinium odoratum*" was a composite production pretty certainly containing elements of *gregaria* and, not improbably, of *Marylandica* and *Smallii*, one or both. On this understanding it might be held that the name *Sanicula gregaria* should give place to *Sanicula odorata* (Raf.), and it would certainly be difficult to show that "*Triclinium odoratum*" was not, in part, the plant now known as *Sanicula gregaria.* To my own way of thinking, however, a resurrectionist acting under the law of priority can rightly proceed only on the authority of facts so unequivocal as to admit of no conflict of opinion whatever.

Sanicula Floridana n. sp.

Nearly allied to *Sanicula Canadensis* but commonly smaller. Stem-leaves more numerous and closer together, the basal ones especially shorter petioled, small, mostly under 2 inches wide, 3-divided, the lateral pair of leaflets parted nearly to the base; leaflets thickish, obovate-cuneate, abruptly narrowed below with concave or excavated sides, adjoining leaflets thus often enclosing lenticular spaces, very acutely dentate-serrate and more or less openly cut-lobed or cleft above, the spiny-cuspidate teeth relatively fewer and larger than in *Canadensis*, their margins pale, callous and thickened and passing gradually into the rigid yellowish spine; involucral leaves and involucres usually small and laciniate; panicle widely branched and slenderly dichotomous; fruit often smaller than in *Canadensis* and more nearly sessile, the bristles, especially below the middle, rather shorter and somewhat less spreading; styles sometimes longer; commissural scar broader, pinched out at the contracted base of the fruit instead of continuing through the pedicel as in *Canadensis;* pedicels of sterile flowers stout and very short, usually not longer than the calyx.

Specimens examined:

South Carolina: Santee Canal, W. H. Ravenel.

Georgia: Savannah, June, 1895, John K. Small.

Florida: Duval Co., open Oak Woodlands, A. H. Curtiss. Type.

Lake City, Columbia Co., July 11–19, 1895, George V. Nash—Plants of Florida, no. 2244; Eustis, Lake Co., Hammock Land, June, 1894, George V. Nash—Plants of Central Peninsular Florida, no. 988.

Alabama: Auburn, Lee Co., July 8, 1896, F. S. Earle and L. M. Underwood.

Mississippi: Ocean Springs, June, 1896, L. M. Underwood.

This plant at once approves itself to the eye as different from *S. Canadensis*, notwithstanding a seeming absence of such crucial characters as subsist between other eastern species. Its distinctive appearance comes mainly from the leaves, the segments showing a marginal pattern which greatly accentuates the style of cutting characteristic of the more northern plant.

In giving to this plant the formal designation of a species, I do not wish to be understood as holding that it is totally disconnected organically from *Canadensis*. Whether it is or is not I do not know, nor is the question one which need affect the right of this positively individualized plant to bear its distinctive name. Undoubtedly, its *species quality* is of lower grade than that of *S. Smallii* or any other one of our explicit eastern species; nevertheless the quality in marked degree is there. It is doubtless a geographical derivative of *Canadensis*, and is so nearly related to it that interrelation may be expected where the ranges of the two adjoin. Certain specimens of *Canadensis* from South Carolina and Georgia appear to show an approach towards it, although typical *Canadensis* extends into Florida, as attested by several specimens, and as far south as Southern Texas as shown by Mr. A. A. Heller's "No. 1713, Plants of Southern Texas, San Antonio, May 5, 1895," which closely matches many northern specimens.

Affinities of Caulinites Ad. Brong.

By Arthur Hollick.

(Plate 320.)

In Science 1: 725, 726 (June 28, 1895) may be found an abstract of the proceedings of the Biological Society of Washington for June 1st of that year, in which Dr. Lester F. Ward calls

attention to the similarity in appearance between the rhizomes of *Tripsacum dactyloides* L. and the fossil organisms known under the generic name of *Caulinites* Ad. Brong.

Recently Dr. Ward sent to me the rhizomes upon which he based his conclusions, with the suggestion that I make drawings of them and reproductions of some figures of *Caulinites*, for closer comparison, and prepare a brief article on the subject.

Authorities have differed in opinion regarding the probable affinities of this genus. Desmarest, who was the first to figure and name a specimen referable to it (Nouv. Bull. Soc. Phil. Sci. Nat. 2: 272. *pl. 11, f. 4.* 1811.)* supposed the specimen to be a polyp and called it *Amphitoites Parisiensis*, under which name it was reproduced by Cuvier and Alexander Brongniart. (Essai Géog. Minéral Envir. Paris, in Mem. Inst. Imp. France, Cl. Sci. Math. et Phys. 1810. Part 1. 165. *pl. 2, figs. 10 A, 10 B.* 1811.) Desmarest subsequently decided that it belonged in the vegetable kingdom and compared it with *Zostera.* (Ann. Sci. Nat. Paris. 1: 334. 1824.) Adolph Brongniart likewise recognized the botanical characters of similar organisms under the generic name of *Culmites.* (Descr. Géol. Envir. Paris, 359. 1828.)* He also compared *Amphitoites* with *Caulinia* DC. (*Posidonia* Kön.) and renamed the genus *Caulinites*, placing it under the Naiadaceae. (Prod. Hist. Vég. Foss. 115. 1828.) In this view he was followed in part by other authorities and finally the several described species of *Culmites* and *Caulinites* were apportioned among a number of different genera and families. Heer considered similar organisms to belong with the grasses, placing them under the genera *Arundo* L. and *Phragmites* Trin. (Fl. Tert. Helvet. 1: 62, 64. 1855.) while Lesquereux described and figured specimens from Clear Lake, California, under the name *Caulinites Beckeri* (Proc. U. S. Nat. Mus. 10: 36. *pl. 1, f. 3; 2, figs. 2–4.* 1887), placing them with the Naiadaceae. In connection with this description, however, is a footnote, consisting, in part, of a letter from the collector, Mr. G. F. Becker, suggesting that they are probably silicified fragments of "Tule" (*Scirpus lacustris* L.), which grows abundantly on the borders of the lake.

* These two references I have not been able to verify personally. I am indebted to Mr. David White, of the United States Geological Survey, for assistance in this connection.

In Dr. Ward's paper (*l. c.*) the above description is noted, but "Tule" is referred to *Phragmites Phragmites* (L.) Karst., an error which Dr. Ward writes me arose from the fact that he believed Becker's specimens to belong to that genus and not to *Scirpus*.

In this connection a note of interest may be found in the American Naturalist, 31 : 227. 1897, in relation to stolons of *Phragmites* ,from islands in the Platte River, Nebraska, where it is stated that the long trailing stems, which are at first under ground, have become exposed by the erosion of the surrounding sand and now run over the surface as jointed stolons, with fibrous roots at the joints.

A paper relating to the same subject may also be found in a recent number of the BULLETIN, in which is described and figured the culms and rhizomes of a supposed fossil grass.* A comparison between certain of the figures which illustrate that paper and those now given are of interest and significance.

Taking all the facts into consideration there seems to be but little doubt that most of the organisms described under the genus *Caulinites* should be regarded as belonging to the rhizomes of grasses, sedges or rushes, and it is unfortunate that the generic name implies relationship with the Naiadaceae.

Explanation of Plate 320.

Figs. 1, 1 a. Rhizome of *Tripsacum dactyloides* L., from Great Falls of the Potomac, Maryland side, collected by Dr. Lester F. Ward, April 27, 1895.—Fig. 1, upper surface ; fig. 1 a, under surface of same.

Figs. 2, 3. *Caulinites digitatus* Wat. Plant. Foss. Bass. Paris, *pl. 19, figs. 7, 8.*

Fig. 4. *Arundo* (*Donax*) *Goepperti* (Münst.) Heer, Fl. Tert. Helvet. 1 : *pl. 23, fig. 5.*

Proceedings of the Club.

TUESDAY EVENING, OCTOBER 12, 1897.

The first meeting of the Club, after the summer vacation, was held in its new quarters at the College of Pharmacy. The President occupied the chair and 24 persons were present. In the absence of the Secretary, Mr. Willard N. Clute was elected Secretary pro-tem.

* A new Fossil Grass from Staten Island. Arthur Hollick, Bull. Torrey Bot. Club, 24: 122–124. *pl. 298.* 1897.

No regular program had been prepared for this meeting, but notes detailing some results of the summer's work were presented by Drs. Rusby and Underwood, Mr. C. Van Brunt, Mrs. E. G. Britton, Judge Brown, Mr. Eugene Smith, Mr. M. A. Howe and Miss Ingersoll.

Dr. H. H. Rusby spoke of his work at the Kew Herbarium in identifying some 2,000 plants of two Bolivian collections. As an indication of how the Columbia University has grown in the last few years, he noted that in working up a similar collection four years ago, he was able to determine but 5 or 6% by comparison with the plants in this herbarium, while of the present collection nearly 50% were identified by this means. He added that the herbarium at Kew is also growing rapidly and in four years has added to its collections nearly half as many specimens as are in the Columbia Herbarium.

Dr. L. M. Underwood supplemented these remarks by an account of his experiences at Kew during the summer. One of the objects of his visit to Kew was to see the type specimens of Berkeley's fungi, which he said were mostly described in two brief lines of Latin, and in the majority of cases the specimens were even briefer than the descriptions, and were in a very unsatisfactory condition. He was also able to clear up some vexed points in reference to common species of fungi, which had been described in England without reference to the species' nearest allies, and were wrong in consequence.

An investigation of the distribution of the ferns given by the Synopsis Filicum showed the allowance of such wide distribution, that under one name there are often several species, and in some cases as many as eight. Dr. Underwood remarked that the Kew Herbarium is superior to the Paris Herbarium even in the plants of the French provinces. Of these, many are represented at Kew and not at all at Paris.

Mr. Cornelius Van Brunt spoke of his journey to the Selkirk and Rocky Mountains of British America, during which he made many photographs of new or interesting plants.

Mrs. E. G. Britton remarked upon the abundance of *Botrychium ternatum obliquum* and *B. t. dissectum* on the Berkshire Hills of Mass., and mentioned the frequency of the fronds forking. She

also described a new *Ophioglossum*, found by Dr. Crawford and Mr. Pollard, near Cape May, N. J., growing in dense, yellowish patches.

President Brown spoke of his summer at Sam's Point in the Shawangunk Mountains. It is a wild region with many precipitous ledges. He described one precipice with an altitude of 2200 feet, bearing pine trees on its summit only six inches high, but with perfectly developed cones. Throughout the region *Arenaria Groenlandica* was abundant in bloom from June to September, most copiously in July. He remarked upon the abundance and profuse bloom of *Gentiana quinquefolia*, *Kalmia latifolia*, *Rhododendron maximum*, *Ilex montana*, *Gaylussacia resinosa* and *Rhodora*.

Mr. Eugene Smith recorded the finding of *Woodwardia areolata* in Bergen Co., N. J.

Mr. M. A. Howe recorded the occurrence of *Pogonia pendula* near Battleboro, Vt. This is the only known station for that plant in the state.

Mrs. Britton reported two mosses new to the local flora, *Thamnium Alleghaniense* from Bedford, Westchester Co., N. Y., and *Bryum concinnatum*, the third time collected in America, now from Bashbish Falls, Copake, N. Y.

Miss Bertha Swalb and Miss Bernice Mayers were elected active members.

WEDNESDAY EVENING, OCTOBER 27, 1897.

There were 23 persons present; Vice-President Dr. Allen presiding.

Mr. Wm. L. Riddell was elected an active member.

The scientific program included two papers. The first paper by Mr. P. A. Rydberg, entitled "Botanical Explorations in Montana during the Summer of 1897," discussed the alpine flora of Montana, exhibiting herbarium specimens and drawings. Mr. Rydberg described a collecting trip made by him and Mr. Ernest A. Bessey to Old Hollow-top, a mountain of 10,000 feet altitude in the Pony or South Boulder Mountains. In a swamp at the foot of the peak, they had found *Ledum glandulosum*, *Kalmia microphylla*, *Cassiope tetragona* and three species of *Bryanthus*. These

finds were remarkable, as ericaceous plants are rather rare in Montana. In aspect the place resembled bogs of Michigan and of Sweden.

The paper further contained a list of the more remarkable plants collected on Old Hollowtop, followed by a short description of the general nature of its flora and that of the other alpine peaks of Montana. Their characteristic plants, like those of other alpine regions, are remarkable for their small size and their brightly colored flowers. Most of them are but 2 to 3 inches high; few exceed 5 inches. The mountain side of Old Hollowtop presents a mixture of golden yellow, indigo-blue, the richest magenta, the most delicate pink, violet and snowy white, with a mat of the brightest green for a background.

The forage plants of these alpine peaks are chiefly small cespitose clovers, and include but few grasses. During the summer four or five such clovers were collected, one or two of which are undescribed. Among the trees and shrubs of the alpine peaks, the most remarkable were the five small alpine willows collected, forming a light green mat covering the mountain-side above timber line. The smaller willows of the White mountains and of the Alps and of Siberia are giants compared with these dwarfs of the Rockies. Four of these Montana willows, with *Salix rotundifolia* from the island of Unalaska, are the smallest shrubs of Salicaceae in the world. Two of these pygmies are new to science; one of which, growing often only half an inch high, is believed to be the smallest species of willow known.

In the discussion following, Dr. Britton inquired regarding the similarity or difference of circumboreal willows.

Mr. Rydberg said that *S. herbacea* apparently remains the same in both hemispheres; so does *S. arctica;* and *S. Brownii* does so through a wide range in North America.

Dr. Britton remarked that Mr. Rydberg's Montana trip was the first expedition sent out officially by the New York Botanical Garden.

Prof. Burgess referred to a supposed age of 34 years for a dwarf willow of about 6 inches stem from Alaska, and Dr. Rydberg mentioned 12 years as perhaps the age reached by the dwarfs of his present paper, their stems dying along the rooting base too rapidly to permit great age.

Dr. Rusby spoke of arctic willows as part of the food of beavers and of reindeer in northern Russia.

The second paper was by Dr. John K. Small, "On the genus *Eriogonum* north of Mexico," a genus founded by Michaux upon a single species in 1803, and increased by Pursh and Nuttall. Bentham issued its first monograph n 1837, with 28 species, and a second with 81 in 1856; Torrey and Gray in a thi monograph in 1870 left the number unchanged, but with many reductions and additions. A fourth monograph by Dr. Sereno Watson in 1870, presented 95 species, since which many have been described by others, as Greene, Jones and Eastwood.

In discussing this paper, Dr. Allen contributed an entertaining description of his difficulties in bringing growing specimens of *Eriogonum Alleni* from near White Sulphur Springs to the Botanical Garden. Dr. Britton reported that the specimens then secured have done well in cultivation at Bronx Park, and have matured seeds.

Dr. Allen spoke of finding two or three species of *Eriogonum* in the Grand Canyon of the Colorado last summer, and described his descent of the Canyon by mule trail, and also his journey to California in search of Characeae.

Dr. Britton reported two cases of naturalization of escapes from greenhouses; The first that of a creeping form of *Oxalis corniculata*, now becoming a weed at Whitestone, L. I.

The second case is that of a fern, apparently an *Asplenium* from a temperate habitat, thrown out with other things as useless, four or five years ago from a greenhouse, growing discolored and sickly in the greenhouse, but now thrifty and spreading under trees on a lawn.

Other cases of fern naturalization which have been previously reported include that of an *Adiantum* in Rhode Island, by Mr. Davenport, and a *Pteris* in a rock-cut near the New York Central Railroad tunnel in our own city; noted by Mr. W. A. Clute.

TUESDAY EVENING, NOVEMBER 9, 1897.

Vice-President Rusby presided. There were 17 persons pres-

The following were elected active members:

Miss Margaret A. Johnston, Mr. L. W. Pinneo, Miss Carolyn M. Grambo, Miss Emilie O. Long.

The paper of the evening by Mrs. E. G. Britton, "A Description of two new Species of *Ophioglossum*," is printed in this BULLETIN. The paper also discussed the affinities, range and type characters of our eastern species of *Ophioglossum*, with keys and specific descriptions and with exhibition of tracings and numerous mounted specimens.

In the discussion following, Dr. Rusby spoke of the growth of *Ophioglossum vulgatum* among sedges on a salt marsh at Great Island, N. J. The other nearest collections reported were those of Austin at Closter, N. J., and of Miss M. Sanial at Rockaway, L. I.

Dr. Underwood sketched the characteristics of the four distinct types of *Ophioglossum* as: 1st, the section typified by *O. vulgatum* and discussed in the paper; 2d, that by *O. palmatum* of tropical America, which extends into Florida, there growing directly under the crown of the palmetto trees, nestled among the leaf-stubs; 3d, that typified by *O. pendulum*, found in the Hawaiian Islands and Pacific regions, which is also pendulous from trees and produces a spike attached almost to the middle of the leaf. In the 4th section, with growth not over 1 inch high, the sterile and fertile fronds are distinct to the rooting base.

Dr. Underwood further remarked the necessity of experience to find forms of *Ophioglossum*, especially such as *O. crotalophoroides* only one inch high, collected by him in Alabama.

Mr. Clute spoke of the great diversity in size displayed by *O. vulgatum* in a single locality.

Professor Burgess referred to the occasional occurrence of *O. vulgatum* with its namesake *Pogonia ophioglossoides*, and to other companion plants with which he finds *Ophioglossum* associated in growth, as *Chiogenes* and especially the orchids *Microstylis ophioglossoides*, *Habenaria hyperborea* and *H. dilatata*.

Dr. Underwood then exbibited photographs of the Kew Gardens, with reminiscences of his visit of last summer. He spoke particularly of their formal decoration, dating back to royal use, and the photographs shown included one of "Queen Mary's Elm," planted by her about 1555, once 25 feet in girth, now represented chiefly by a series of shoots.

After remarks by Dr. Rusby appealing to the Club to secure the membership of all who are interested in botanical science, the Club was adjourned.

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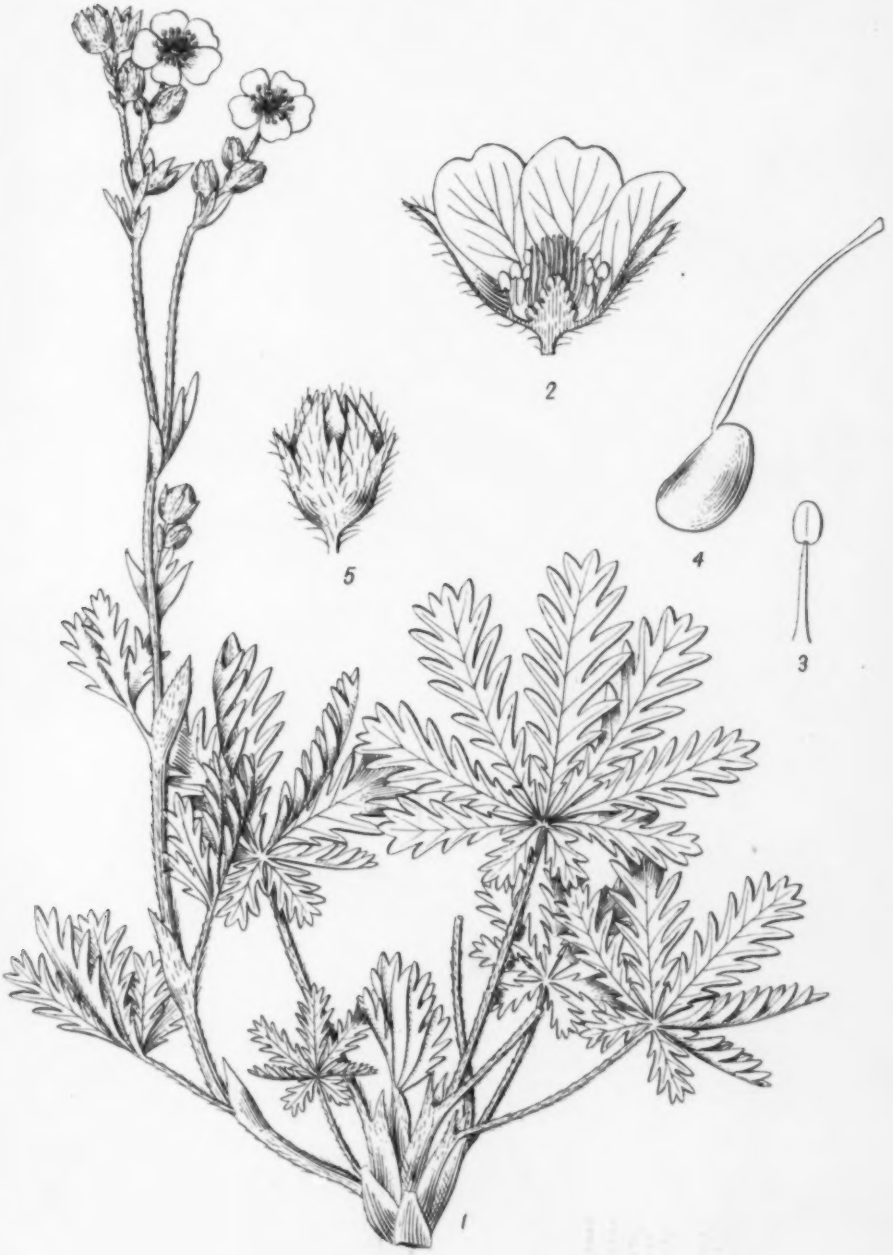
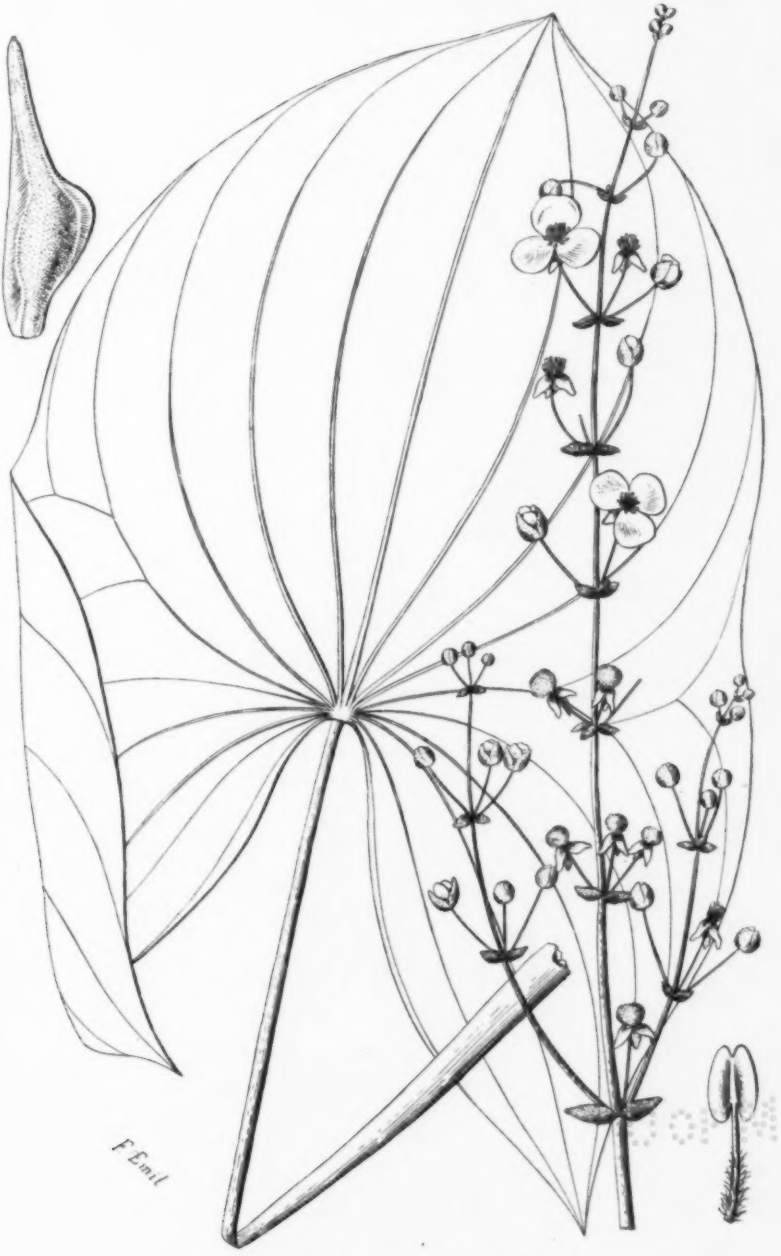


POTENTILLA CANDIDA RYDBERG.

POTENTILLA ATRORUBENS RYDBERG.



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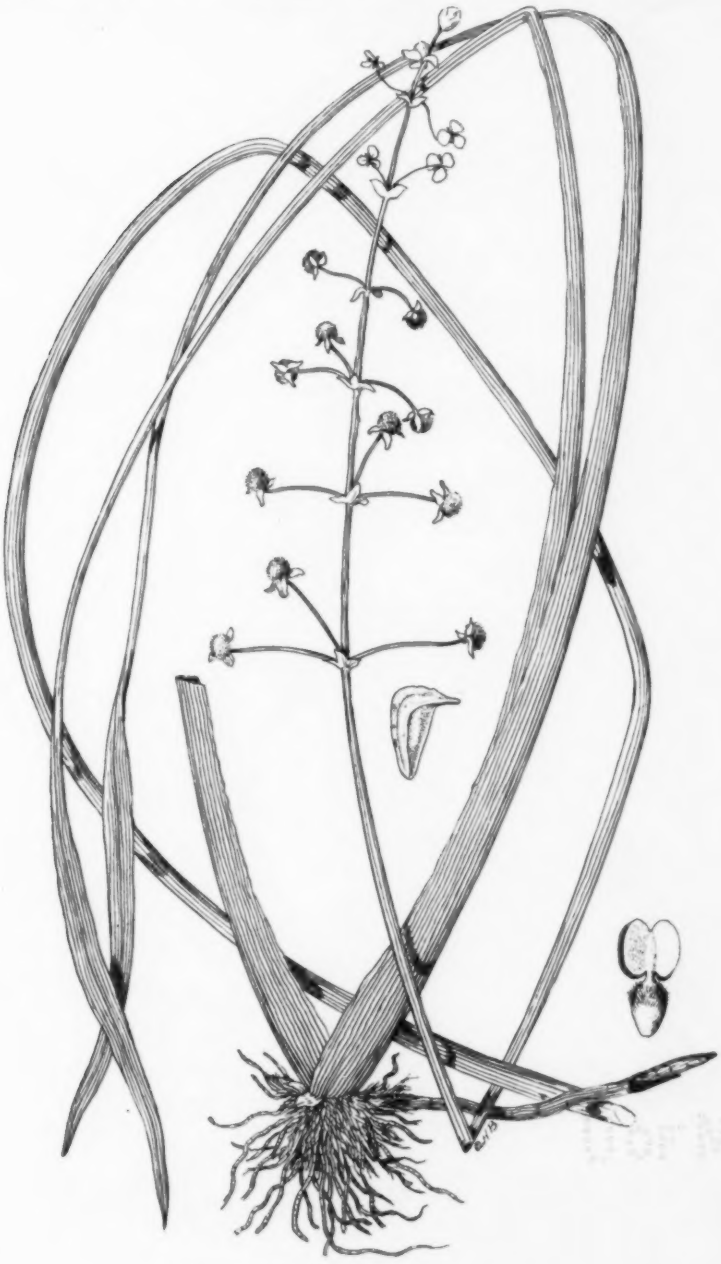
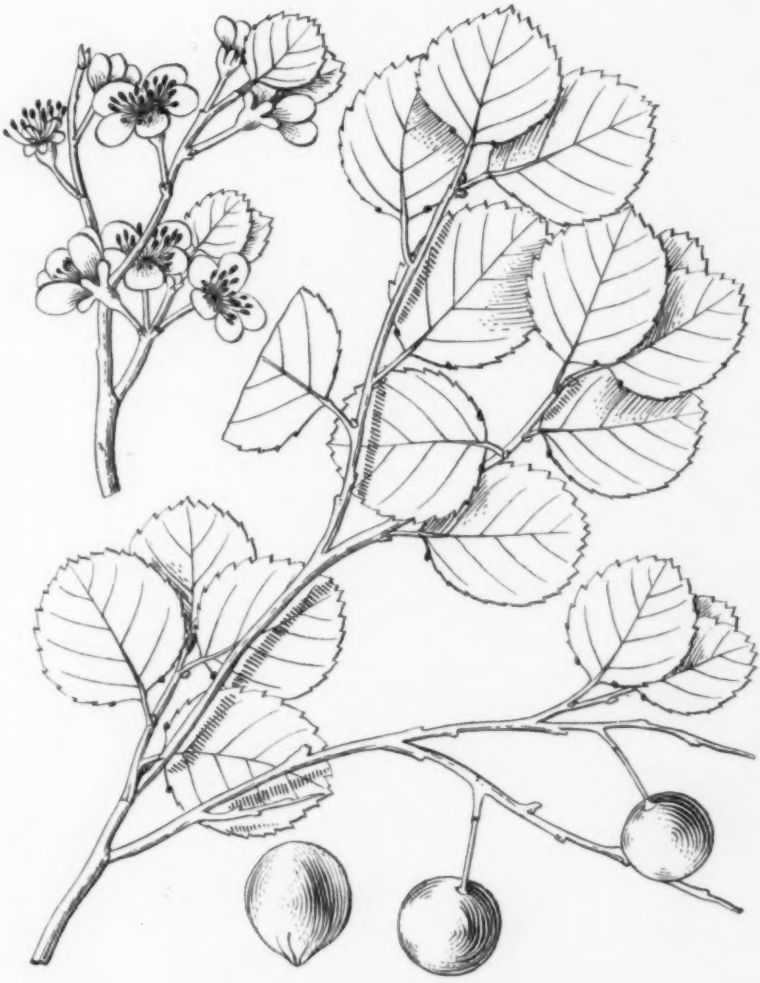


SAGITTARIA MOHRII J. G. SMITH.

SAGITTARIA LONGIROSTRA AUSTRALIS J. G. SMITH.



PRUNUS GRAVESII SMALL.

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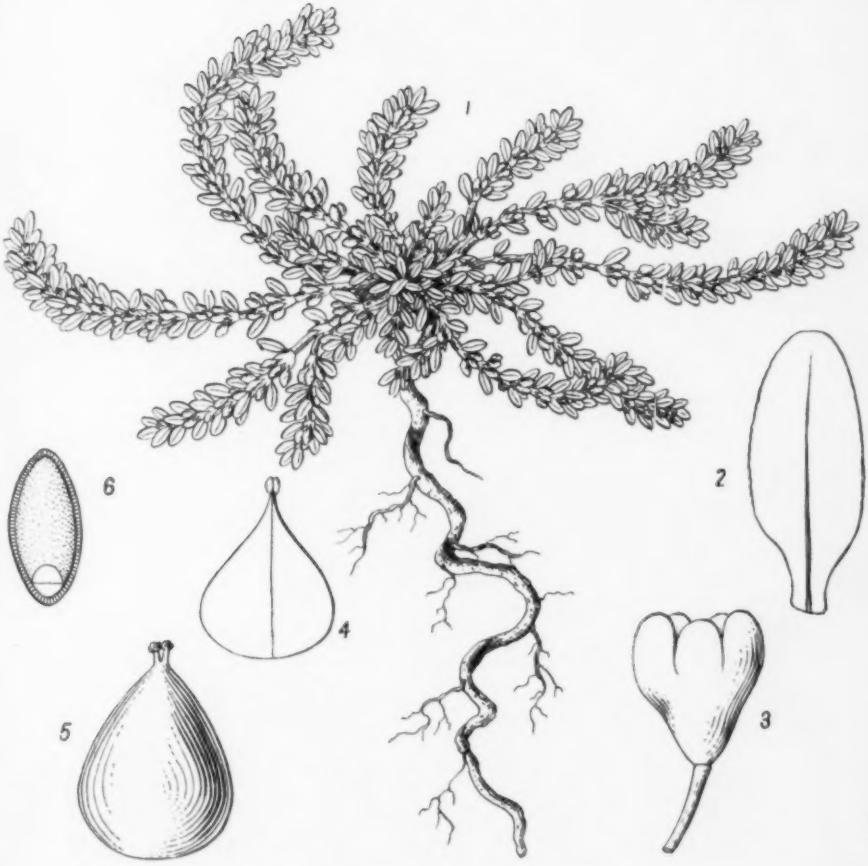


POLYGONUM FALLAX SMALL.

Fig. 1

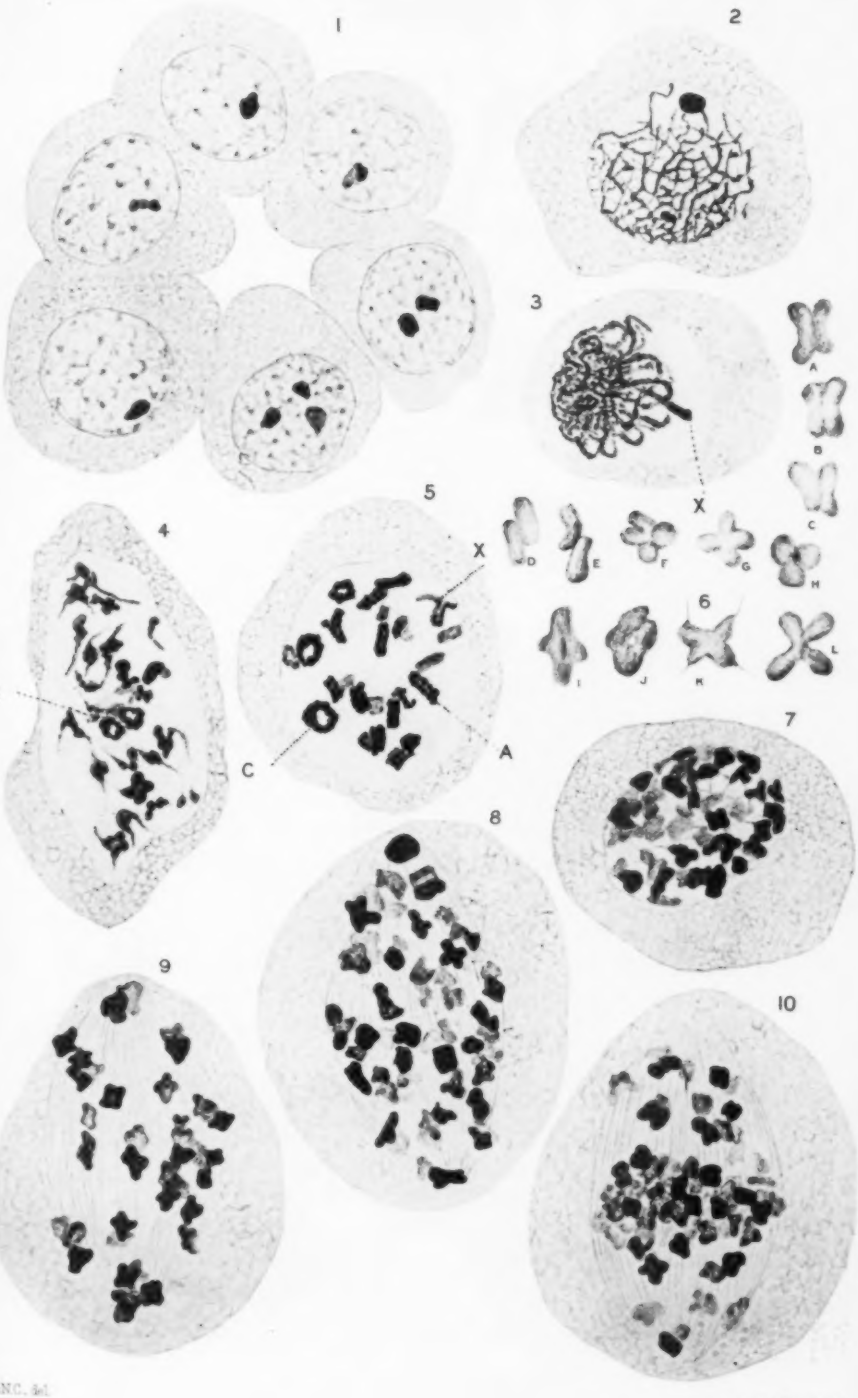
Fig. 2

Fig. 3

Fig. 4.

Fig. 5.

DENDROBANGIA RUSBY.



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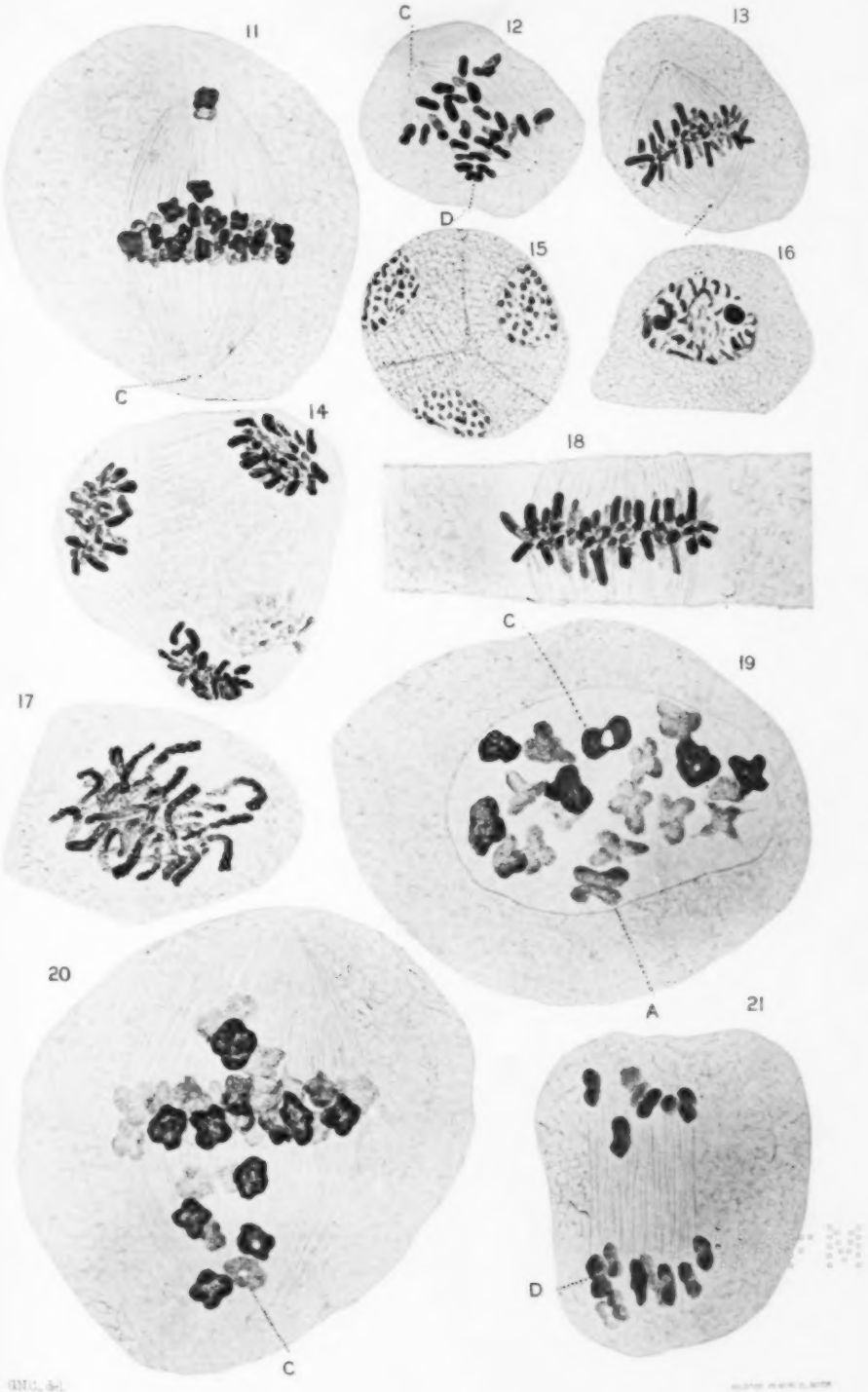
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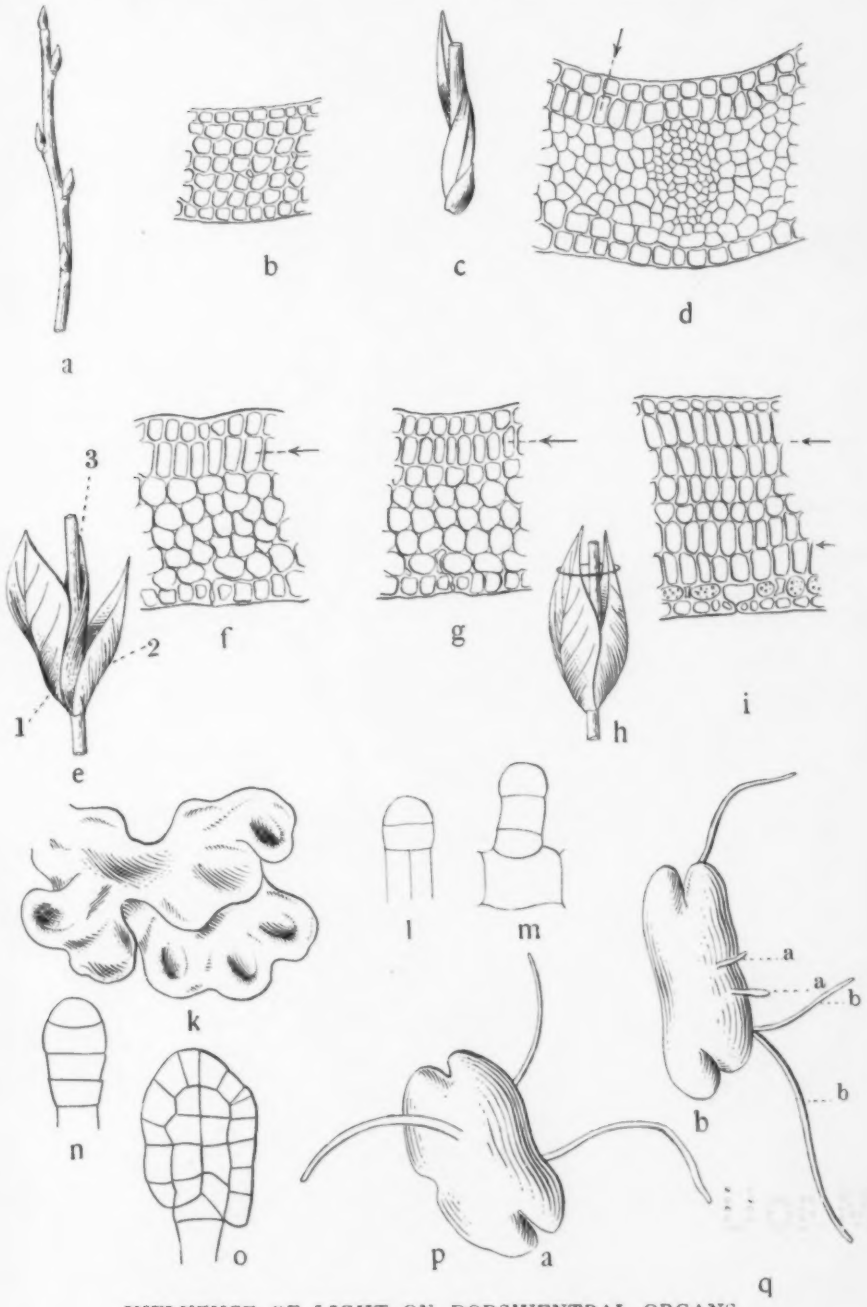
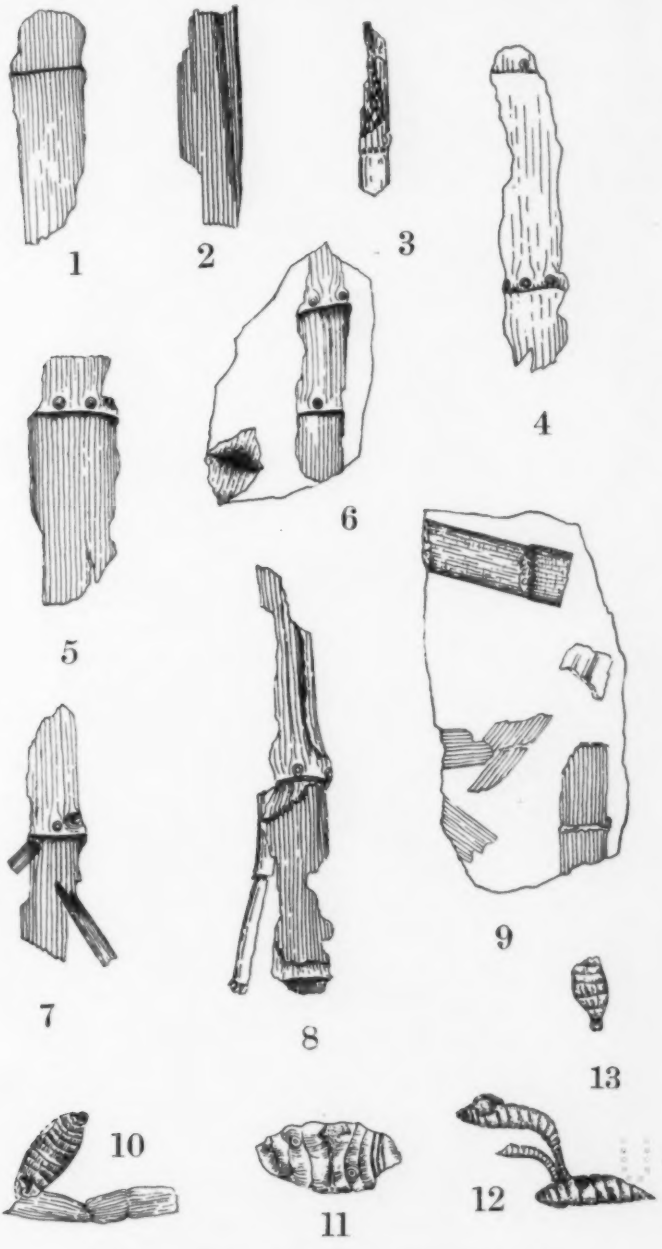


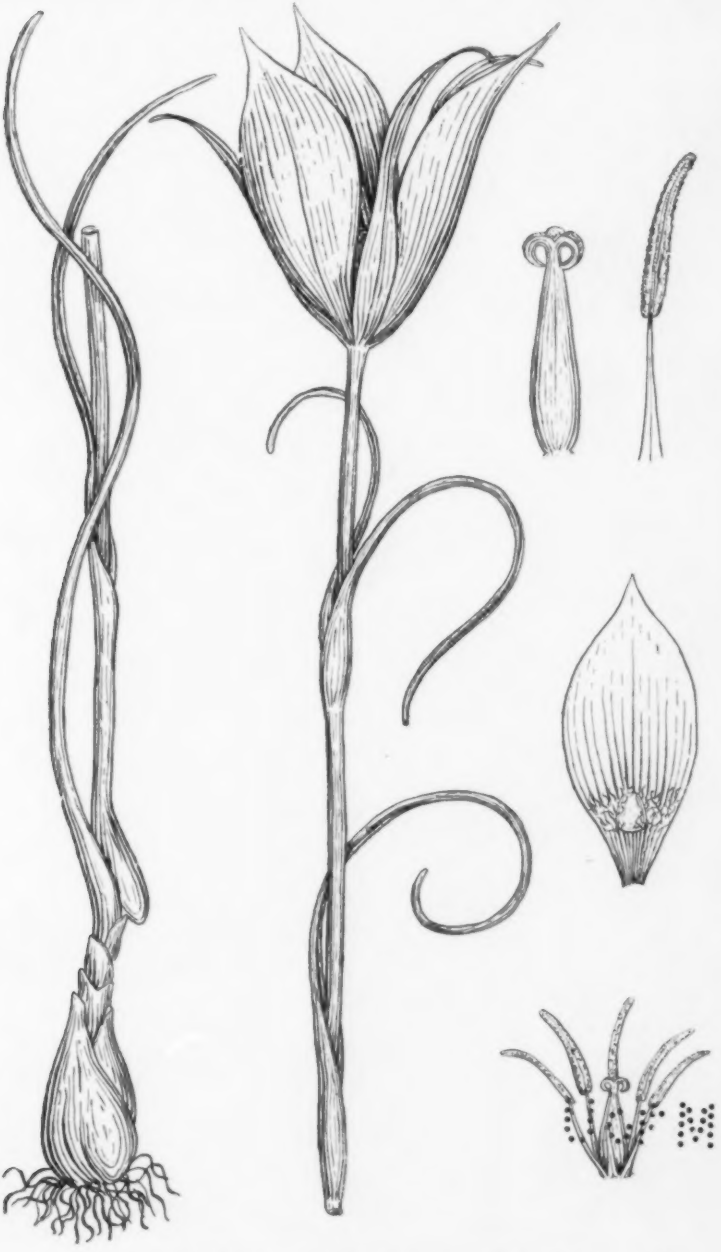
INFLUENCE OF LIGHT ON DORSIVENTRAL ORGANS.



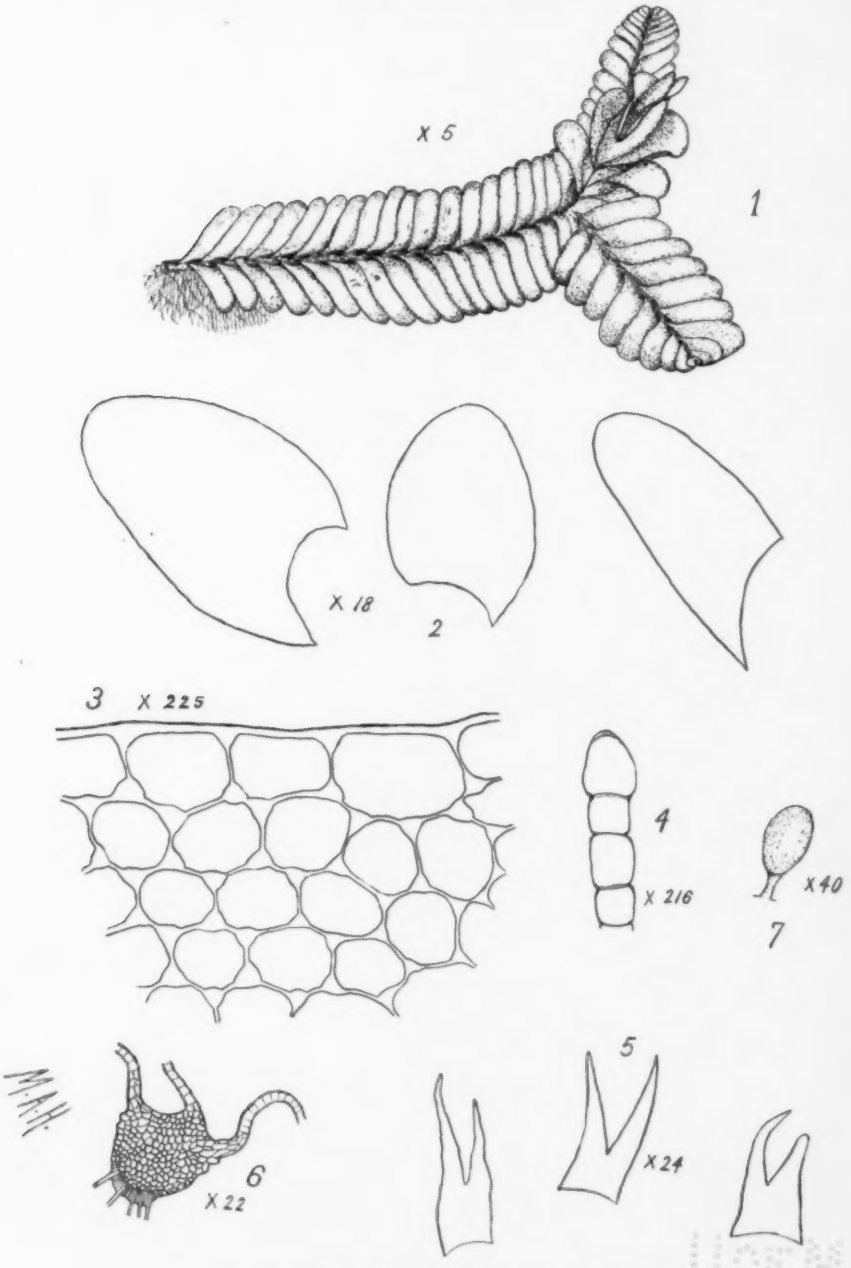
PHRAGMITES AQUEHONGENSIS HOLLICK.

STUDY OF THE GENUS TALINUM.

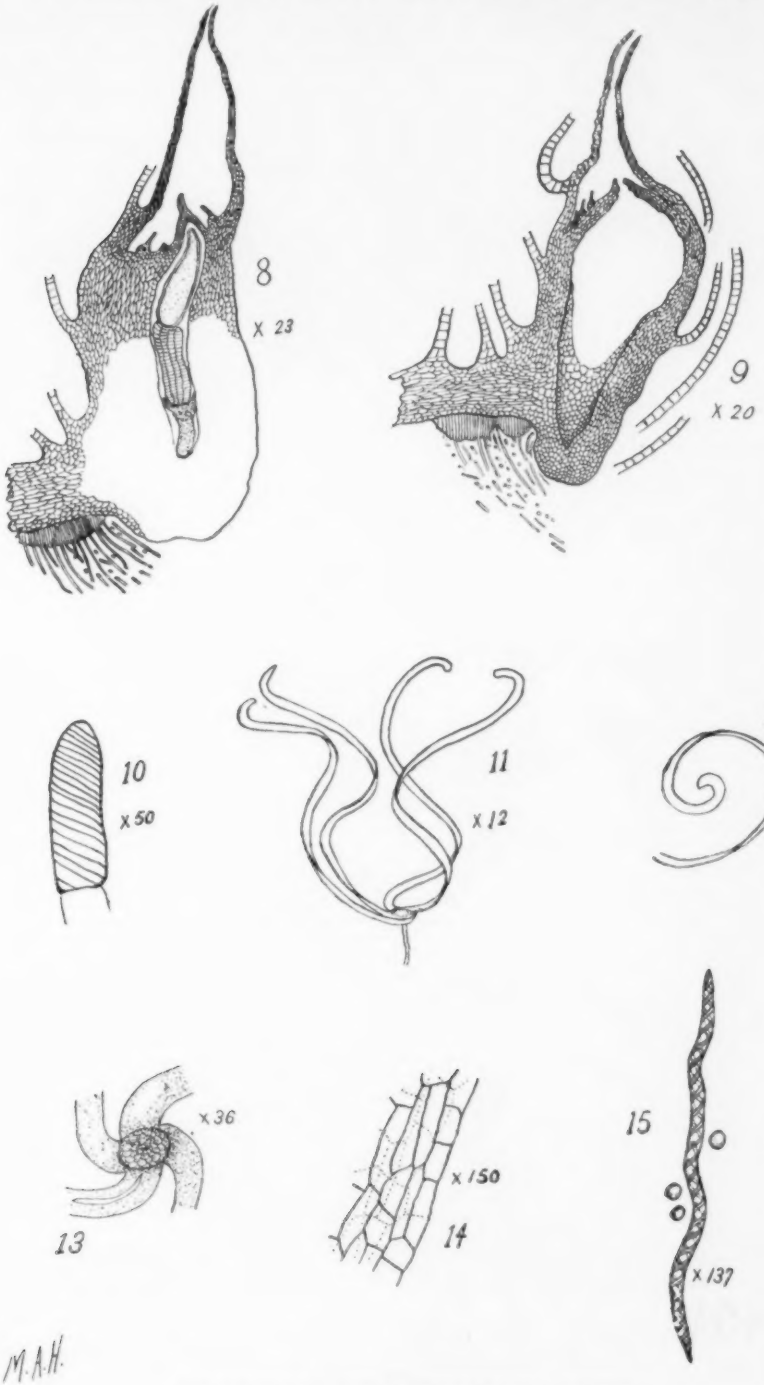
ALLIUM FIBROSUM RYDBERG.



CALOCHORTUS ACUMINATUS RYDBERG.



GYROTHYRA UNDERWOODIANA HOWE.



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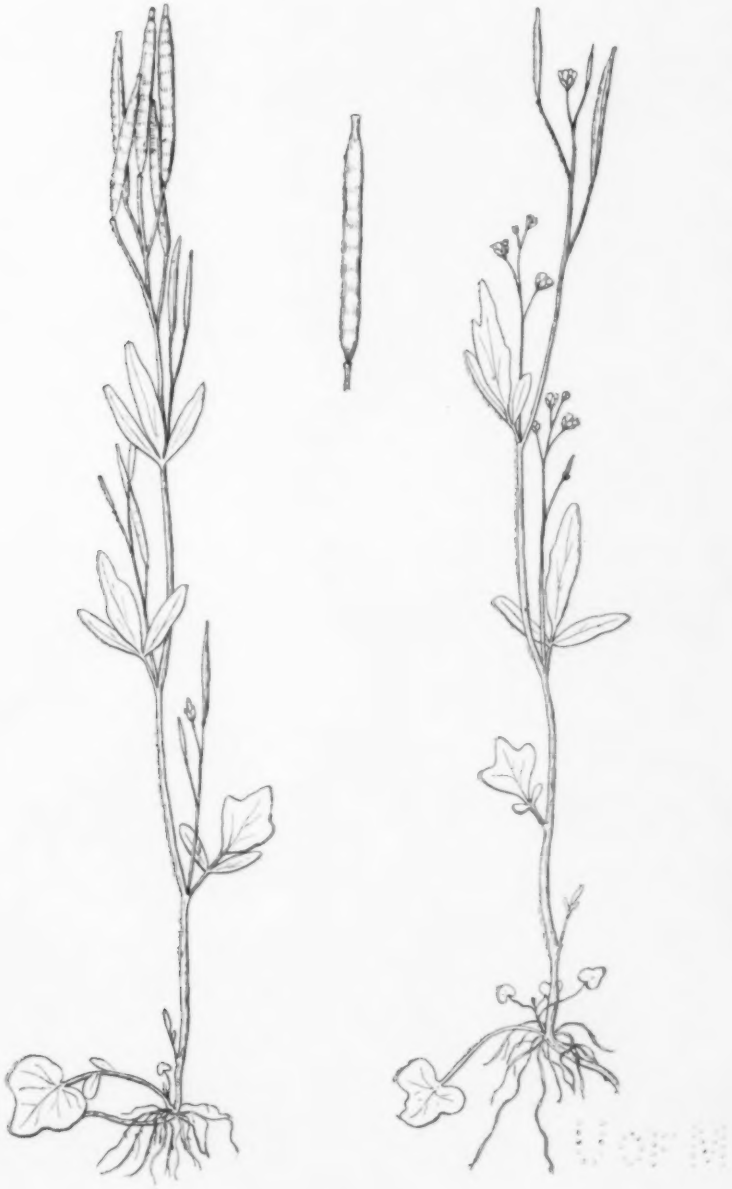
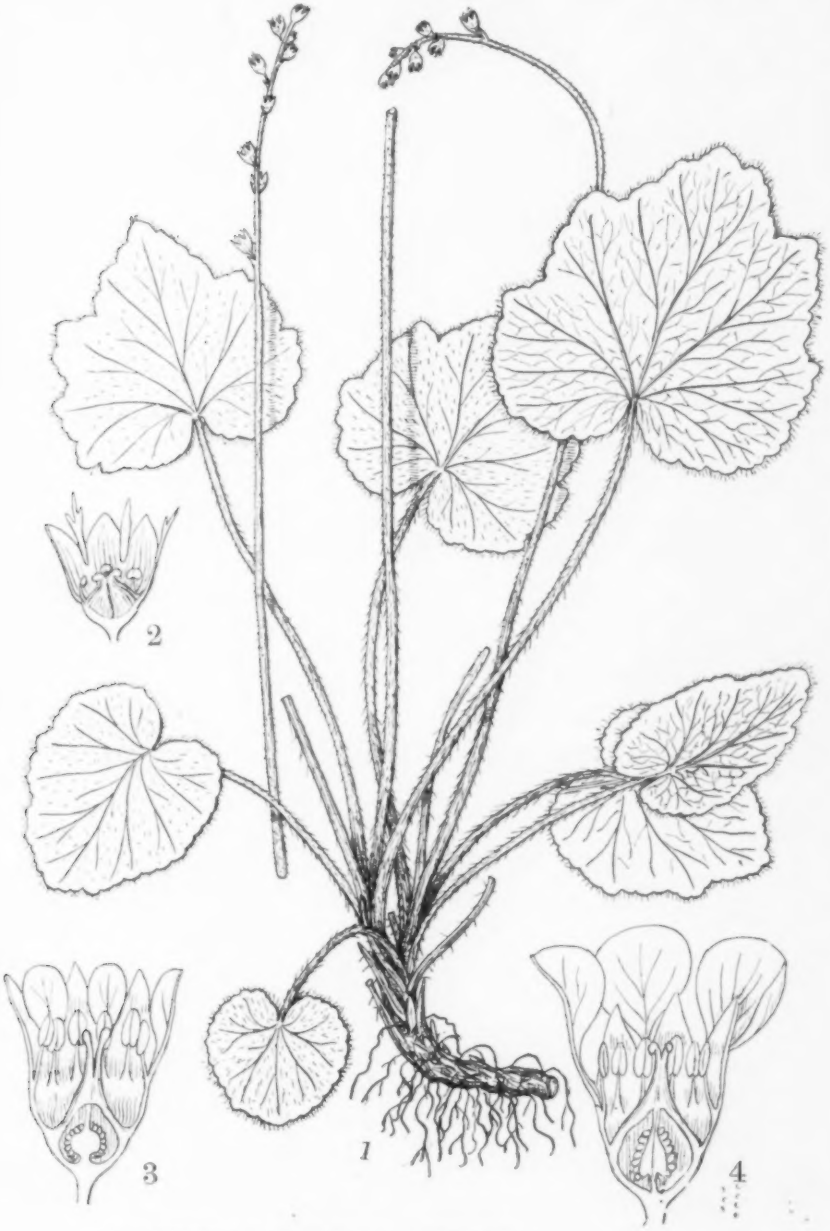
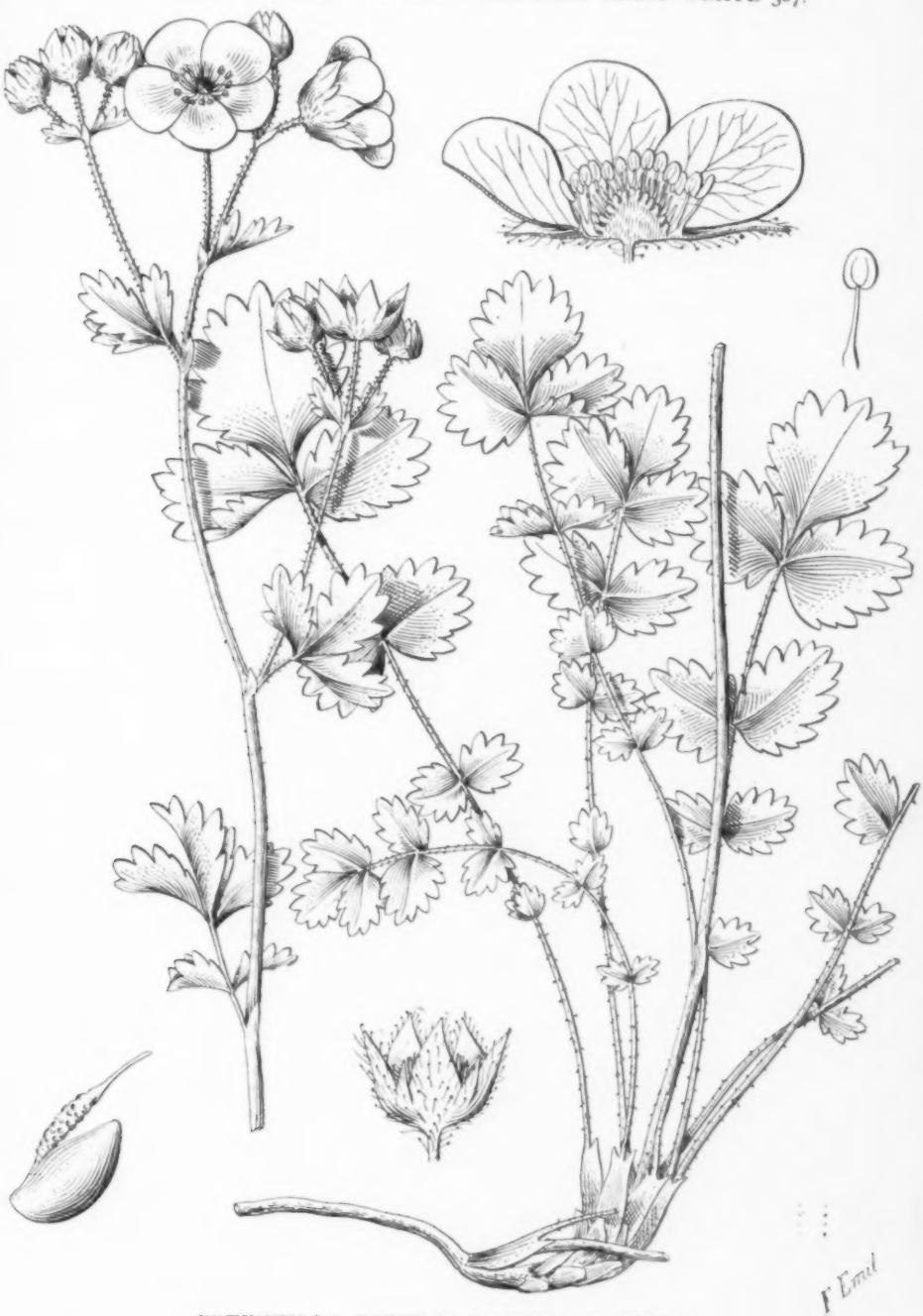


CARDAMINE UNIJUGA RYDBERG.

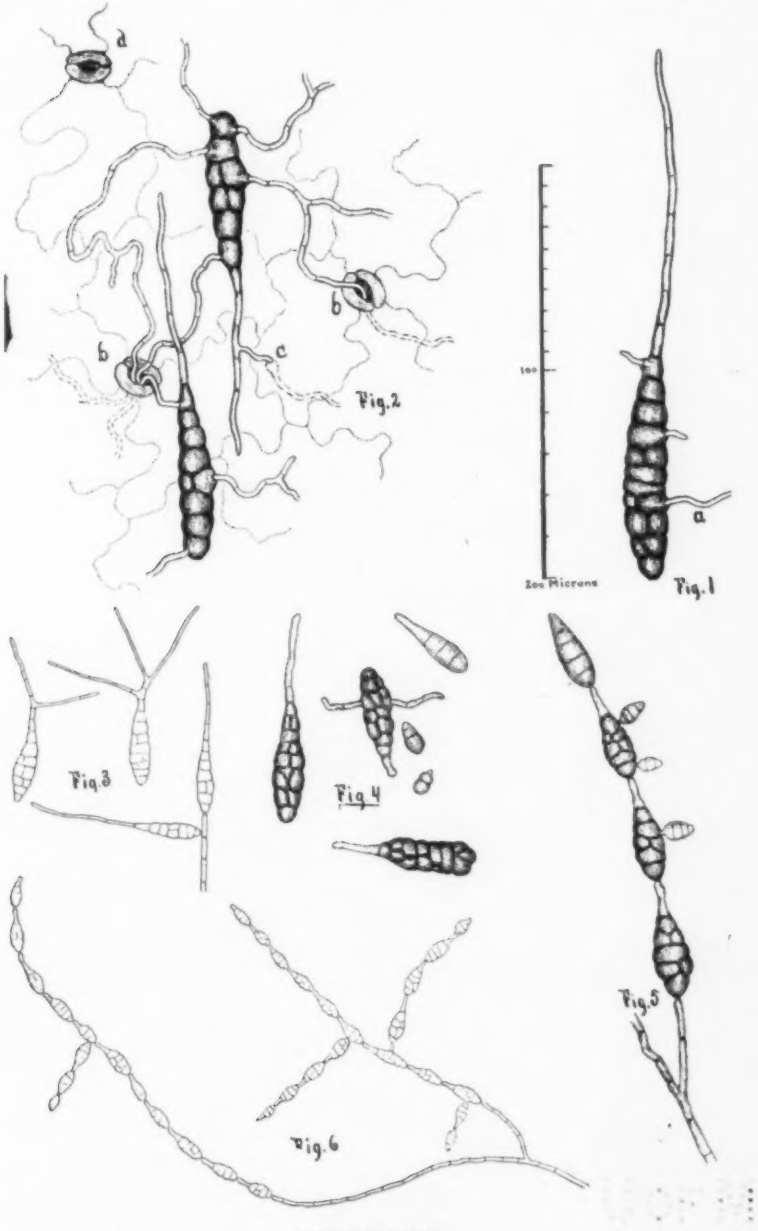


1–2 MITELLA VIOLACEA RYDBERG.
3 THEROFON HEUCHERAEFORME RYDBERG.
4 THEROFON JAMESII (TORR.) WHEELOCK.

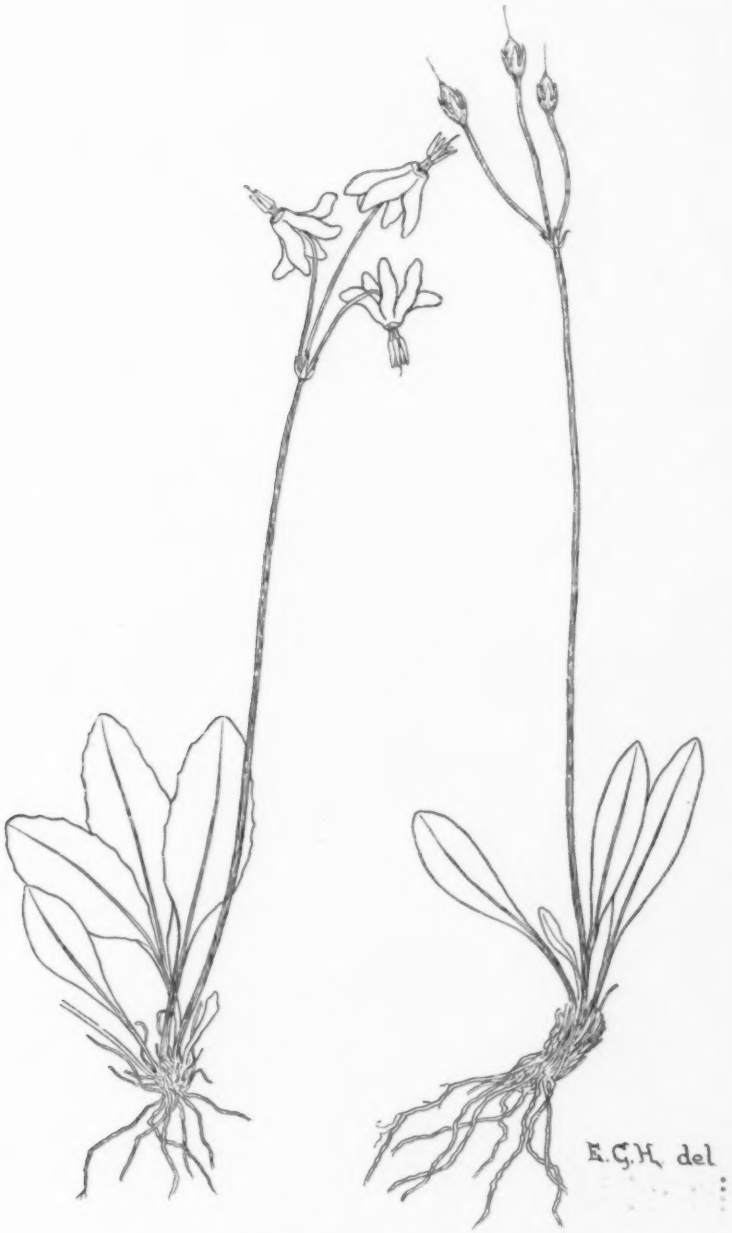
POTENTILLA CONVALLARIA RYDBERG.



POTENTILLA PSEUDORUPESTRIS RYDBERG.

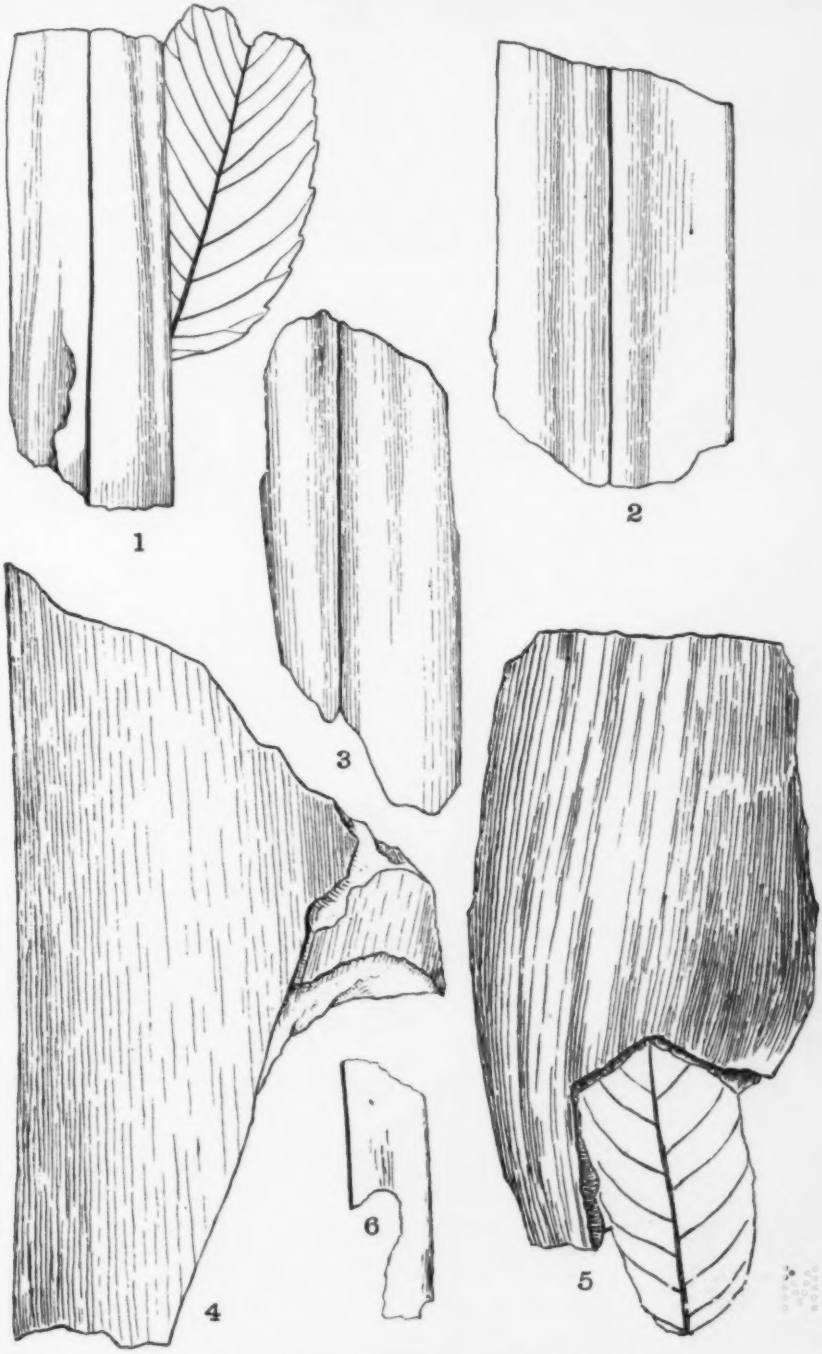


ALTERNARIA.

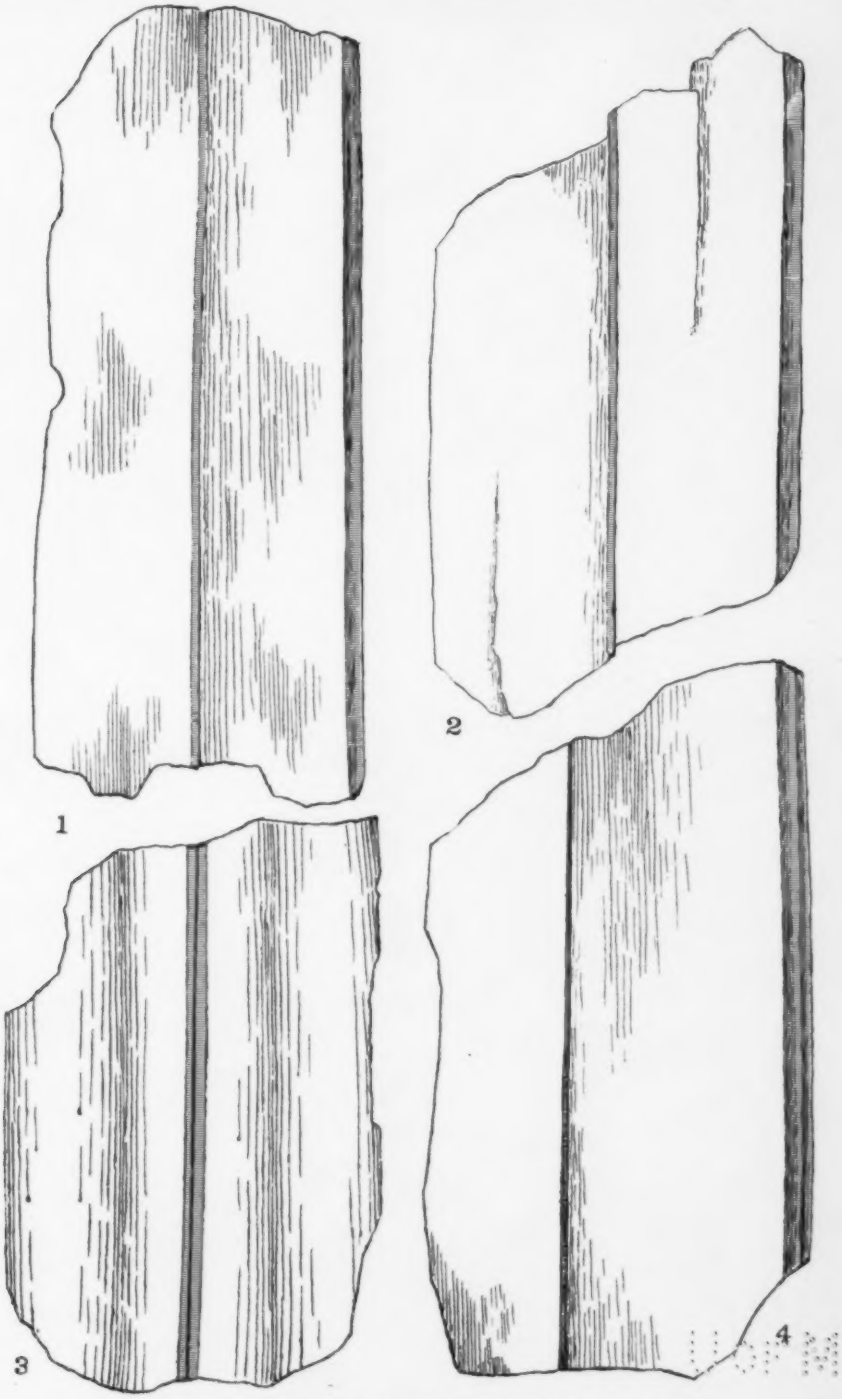


DODECATHEON PUBERULENTUM HELLER.

THALESIA PURPUREA HELLER.



ANOMALOPHYLLITES BRIDGETONENSIS HOLLICK.



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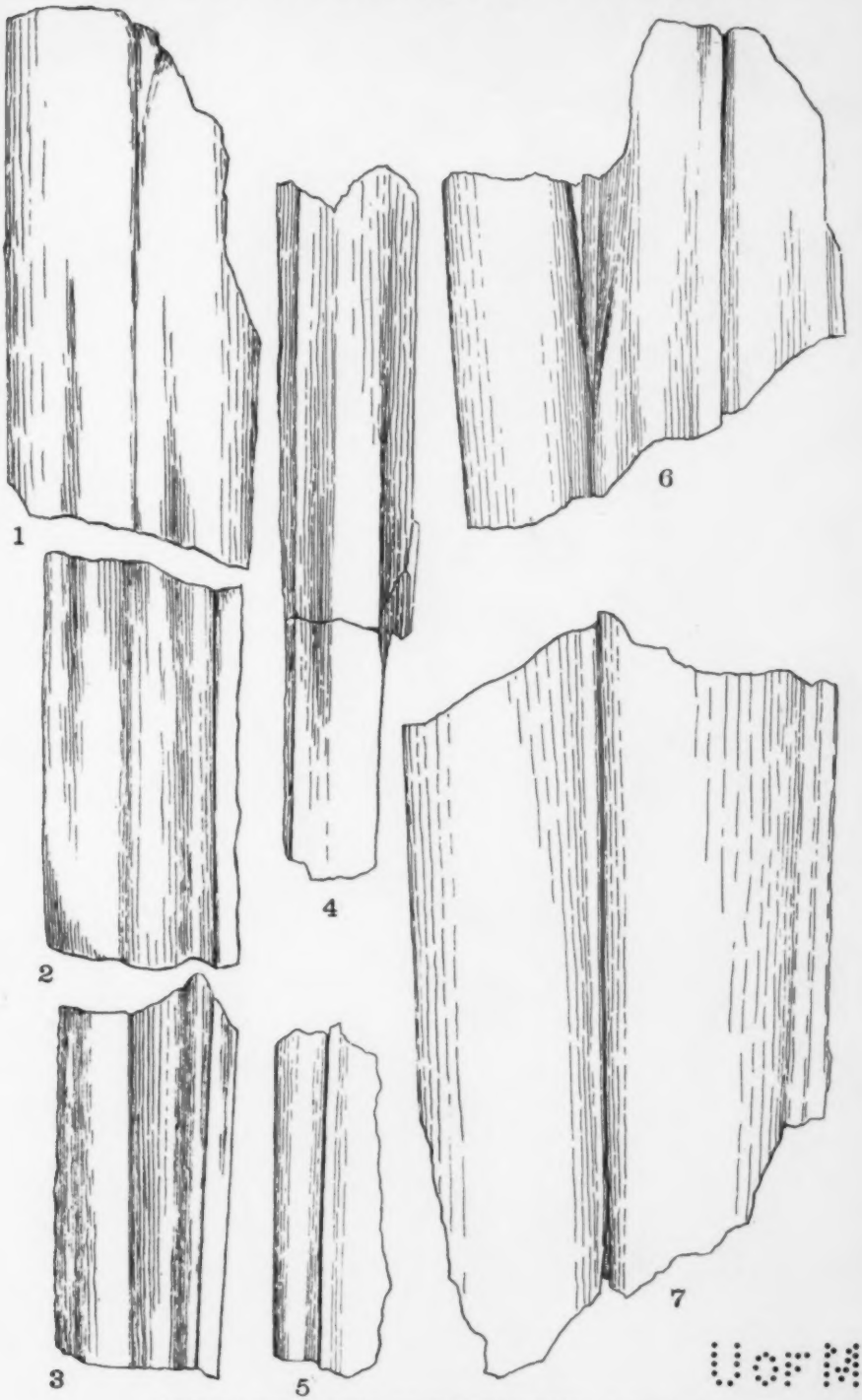

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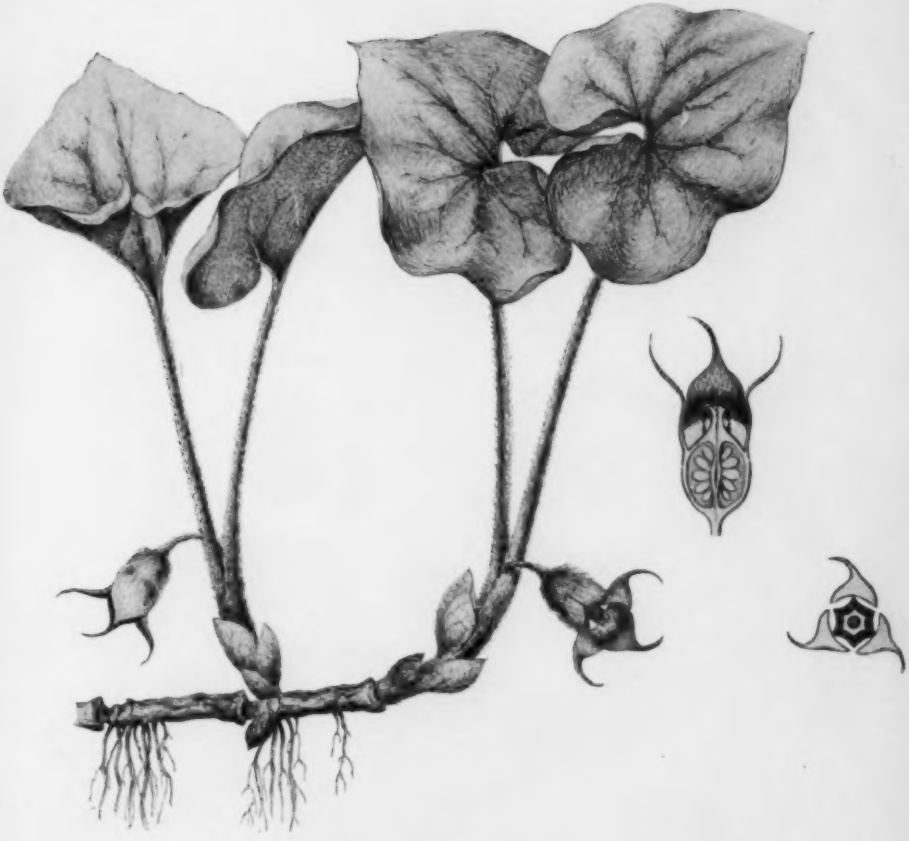

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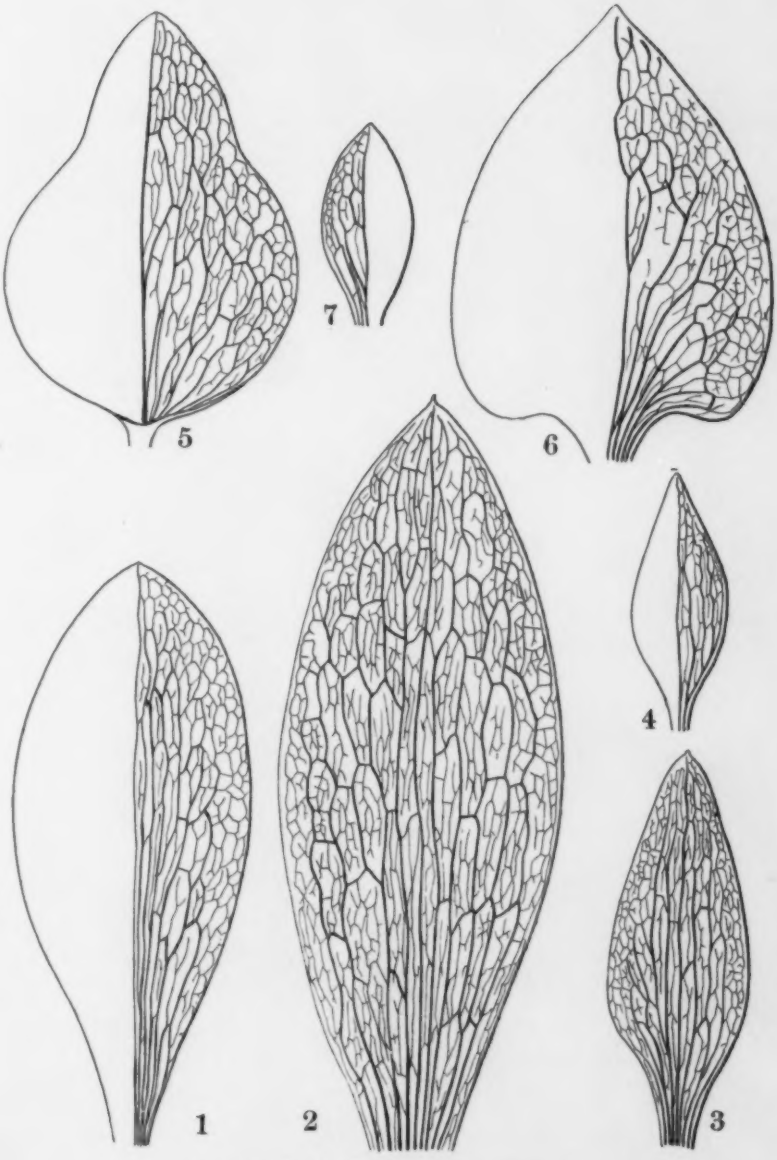

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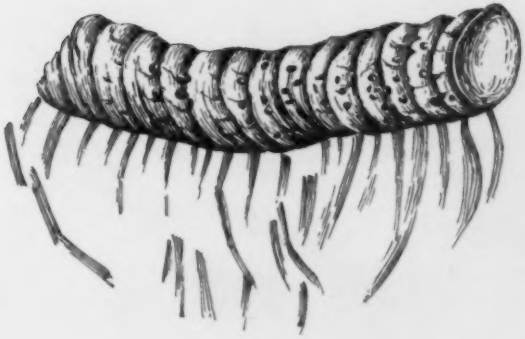

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VOL. 24. DECEMBER. NO. 12.

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CONTENTS:

	PAGE.
A Revision of the North American Species of *Ophioglossum*: *Elizabeth G. Britton* (PLATES 318, 319)	545
New or otherwise interesting Plants of Eastern Tennessee. *T. H. Kearney, Jr*	560
A new Species of *Eucalyptus* from the Dakota Group of Southwestern Kansas: *Lester F. Ward*	576
Two new Species of *Sanicula* from the Southern States: *Eugene P. Bicknell*	577
Affinities of *Caulinites* Ad. Brong: *Arthur Hollick* (PLATE 320)	582
PROCEEDINGS OF THE CLUB	584
INDEX TO RECENT LITERATURE RELATING TO AMERICAN BOTANY	590

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